SPP Southwest Power Pool

Impact Study for Generation Interconnection Request GEN – 2004 – 003

SPP Coordinated Planning
(#GEN-2004-003)

May 2005

Summary

Pterra Consulting performed the following Study at the request of the Southwest Power Pool (SPP) for Generation Interconnection request Gen-2004-003. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Pursuant to the tariff, Pterra Consulting was asked to perform a detailed Impact Study of the generation interconnection request to satisfy the Impact Study Agreement executed by the requesting customer and SPP.

Pterra Consulting

Report No. R112-05

"Impact Study for Generation Interconnection Request GEN-2004-003"

Submitted to

The Southwest Power Pool

May 2005

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Report No. R112-05

"Impact Study for Generation Interconnection Request GEN-2004-003"

1. Executive Summary

This report presents the stability simulation findings of the impact study of a proposed interconnection (Gen-2004-003). The analysis was conducted through the Southwest Power Pool Tariff for a 115kV 240 MW wind farm in Carson County, Texas. This wind farm would be interconnected to the existing Conway district substation via a new 115 kV Main breaker. The Conway district substation is owned by Xcel Energy (d/b/a SWPS). The wind farm will use GE 1.5 MW wind turbines with the standard ride through package.

Two base cases each comprising of a power flow and corresponding dynamics database for 2009 summer and fall were provided by SPP. Transient stability simulations were conducted with the proposed wind farm in service with a full output of 240 MW. In order to integrate the proposed 240 MW wind farm in SPP system, the existing generation is SPP footprint was re-dispatched as provided by SPP.

Twenty (20) contingencies were considered for the transient stability simulations which included 3-phase faults, as well as, 1-phase to ground faults, at the locations defined by SPP. 1-phase faults were simulated by applying a fault impedance to the positive sequence network at the fault location, representing the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

The proposed wind generators were modeled with under/over voltage/frequency ride through protection. The settings were in accordance with standard or default settings.

The simulations conducted in the study did not find any angular or voltage instability problems for the twenty contingencies. However, tripping of the wind farm was observed as follow:

- For peak summer loading condition, the wind farm tripped due to relay actuation in disturbances #1 and #2 (3-phase and 1-phase faults respectively, at Kirby 115kV bus).Tripping of the wind farm because of these specific contingencies is normal since the fault clearing procedures require tripping of Conway115kV at which the proposed 240MW wind farm is connected.

- For fall loading condition, tripping of the wind farm occurred in disturbance # 17 (3-phase fault at Whitaker on Nichols to Whitaker 115kV line) in addition to the two disturbances #1 and #2 as in the summer case. Tripping of the wind farm for disturbance # 17 was mainly due to the actuation of the over frequency relay because of high frequency excursion. It was found that the amplitude of the frequency

excursion in the fall base case is higher than that in the summer base case because of the lesser system inertia.

All oscillations were well damped. The study finds that the proposed 240MW wind farm project shows stable performance of SPP system for the contingencies tested on the supplied base cases.

2. Introduction

2.1 Project Overview

The proposed 240MW wind farm would be interconnected to the existing Conway district substation via a new 115 kV Main breaker. It is anticipated the substation will be modified to add a breaker to accept the interconnection. A new 115 kV line from the Customer collector bus to the Conway district Substation will be built. Figure 1 shows the interconnection diagram of the proposed GEN 2004-003 project to the 115kV transmission system. The detailed connection diagram of the wind farm is provided by SPP.

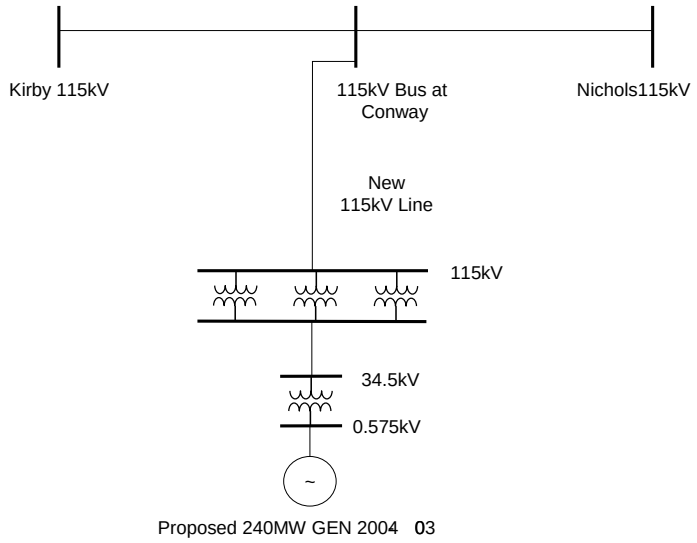


Figure 1. Interconnection Plan for GEN 2004-003 to the 115kV System

In order to integrate the proposed 240MW wind farm in SPP system, dispatch for the existing generation in the following areas SWPA, AEPW, GRRP, OKGE, WFEC, SPS, MIDW, WERE, KACP, EMDE, and SPRM was scaled down by 240 MW.

In order to simplify the model of the wind farm while capturing the effect of the different impedances of cables (due to change of the conductor size and length), the wind turbines connected to the same 34.5kV feeder end points were aggregated into one equivalent unit. An equivalent impedance of that feeder is represented in the load flow database by taking the equivalent series impedances of the different feeders connecting the wind turbines. Using this approach, the proposed 240MW wind farm was modeled with 62 equivalent units as shown in Figure 2. The number in each circle in the diagram shows the number of individual wind turbine units that were aggregated at that bus. SPP provided the impedance values for the different feeders at 34.5kV level. SPP provided the data for the following equipment:

1. 34.5kV feeders
2. Generating unit step up transformers
3. 115kV/34.5kV transformers
4. Data for the new 115kV line

Pterra added two prior queued projects into the base case model before running the fault study. The two prior queued projects are as follow:

1. GEN-2002-019 (160 MW)
2. GEN-2002-022 (240 MW)

SPP provided the data needed to include these prior projects in the final model for GEN 2004-003. The provided data included interconnection points of these two prior queued projects to SPP system, dispatch for existing generation to integrate these projects in SPP system, and the dynamics Database.

2.2 Objective

The objective of the study is, to determine the impact on system stability of connecting the proposed 240MW wind farm to SPP's 115 kV transmission system.

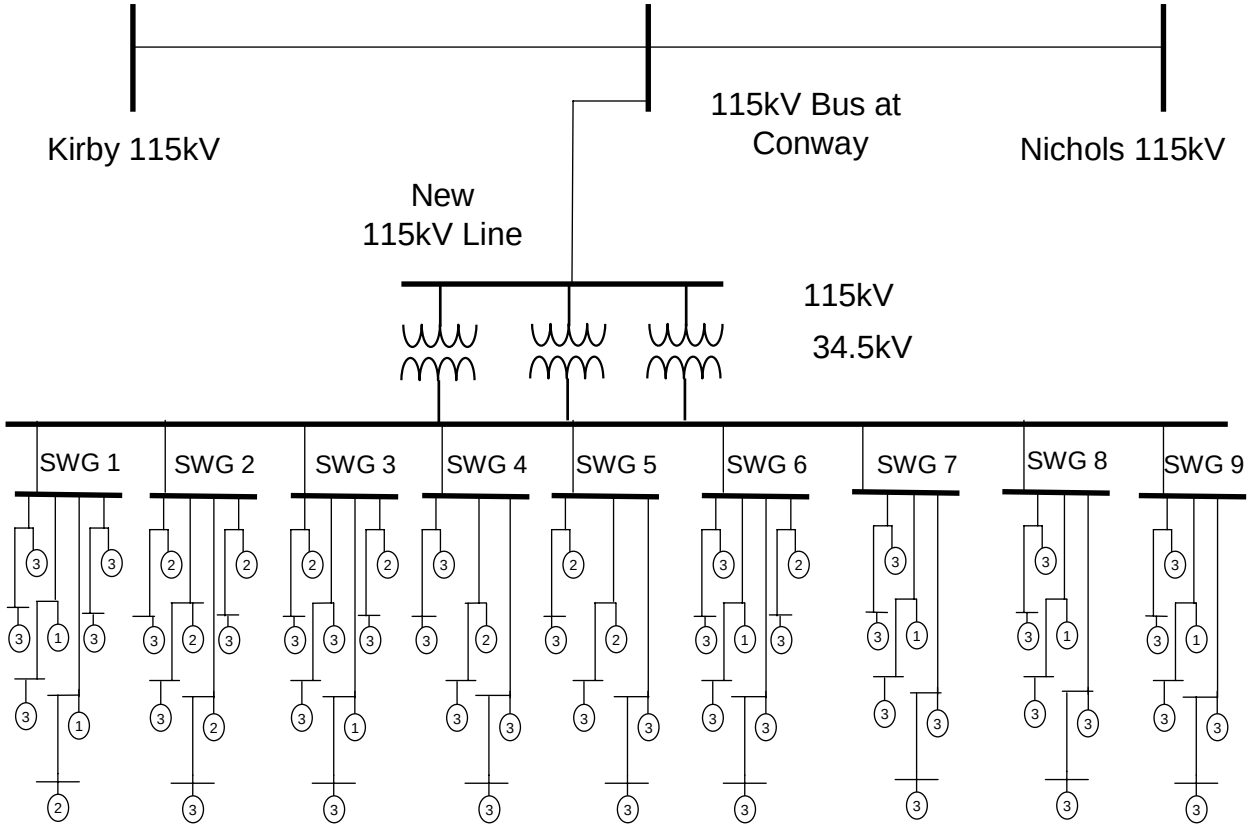


Figure 2. Wind Farm Equivalent representation in Load Flow

3. Stability Analysis

3.1 Modeling of the Wind Turbines

Equivalents for the wind turbine and generator step-up (GSU) transformer in the load flow case were modeled. For the stability simulations, the GE 1.5 MW wind turbine generators were modeled using the latest GE wind turbine model set.

Table 1. GE 1.5 MW Wind Generator Data

Parameter	Value
BASE KV	0.575
WTG MBASE	1.667
TRANSFORMER MBASE	1.75
TRANSFORMER R ON TRANSFORMER BASE	0.0077
TRANSFORMER X ON TRANSFORMER BASE	0.0579
GTAP	1.05
PMAX (MW)	1.5
PMIN	0.0
RA	0.00706
LA	0.1714
LM	2.904
R1	0.005
L1	0.1563
INERTIA	0.57
DAMPING	0.0
QMAX (MVAR)	0.49
QMIN (MVAR)	-0.73

The wind turbine generators have ride-through capability for voltage and frequency. Detailed relay settings are shown in the following tables.

Table 2: Over/Under Frequency Relay Settings for GE Wind Turbine

Frequency Settings in Hertz	Time Delay in Seconds	Breaker time in Seconds
$F \leq 56.5$	0.02	0.15
$56.5 < F \leq 57.5$	10.0	0.15
$61.5 < F \leq 62.5$	30.0	0.15
$F \geq 62.5$	0.02	0.15

Table 3. Over/Under Voltage Relay Settings for GE Wind Turbine

Voltage Settings Per Unit	Time Delay in Seconds	Breaker time in Seconds
$V \leq 0.30$	0.02	0.15
$0.30 < V \leq 0.70$	0.10	0.15
$0.70 < V \leq 0.75$	1.00	0.15
$0.75 < V \leq 0.85$	10.0	0.15
$V \geq 1.10$	1.00	0.15
$1.10 > V \geq 1.15$	0.10	0.15
$1.15 > V \geq 1.3$	0.02	0.15

3.2 Assumptions

The following assumptions were adopted for the study:

1. A constant maximum and uniform wind speed was considered during the entire period of study.

2. The wind turbine control models were used with their default values.
3. The settings for the under/over voltage/frequency were set according to the standard manufacturer data.

3.3 Contingencies Simulated

Twenty (20) contingencies were considered for the transient stability simulations which included three phase faults, as well as single phase line faults, at the locations defined by SPP. 1-phase line faults were simulated by applying a fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice. Table 4 shows the list of simulated contingencies. The table also shows the fault clearing time and the time delay before re-closing for all the study contingencies.

Table 1. List of Contingencies

Cont. No.	Cont. Name	Description
1	FLT13PH	Fault on the Nichols (50914) to Kirby (50932), 115 kV line, near Kirby. a. Apply Fault at the Kirby bus (50932). b. Clear fault after 5 cycles by removing the lines c. Kirby (50932) to Conway (50928) d. Conway (50928) to Yarnell (50926) and e. Yarnell (50926) to Nichols (50914) f. Wait 20 cycles, and then re-close the line in (b) into the fault.
2	FLT21PH	Single phase fault and sequence like Cont. No. 1
3	FLT33PH	Fault on the Kirby (50932) to Grapevine (50826), 115 kV line, near Grapevine a. Apply fault at the Grapevine bus (50826) b. Clear fault after 5 cycles by removing the line from Kirby (50932) to Grapevine (50826). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT41PH	Single phase fault and sequence like Cont. No. 3

Cont. No.	Cont. Name	Description
5	FLT53PH	Fault on the Grapevine (50826) to Bowers (50820), 115 kV line, near Bowers a. Apply fault at the Bowers bus (50820) b. Clear fault after 5 cycles by removing the line from Grapevine (50826) to Bowers (50820). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT61PH	Single phase fault and sequence like Cont. No. 5
7	FLT73PH	Fault on the Kirby to McLelln3, 115 kV line, near McLelln3 a. Apply fault at the Mclelln3 bus (50383) b. Clear fault after 5 cycles by removing the line from Kirby (50932) to McLelln3 (50383). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
8	FLT81PH	Single phase fault and sequence like Cont. No. 7
9	FLT93PH	Fault on the McLelln3 (50383) to McLean Rural (50840), 115 kV line, near McLean Rural a. Apply fault at the Mclean Rural bus (50840) b. Clear fault after 5 cycles by removing the line from McLelln3 (50383) to McLean Rural (50840). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT101PH	Single phase fault and sequence like Cont. No. 9
11	FLT113PH	Fault on the Grapevine (50827) to Elk City (54153) 230 kV line, near Elk City. a. Apply fault at the Elk City bus (54153). b. Clear fault after 5 cycles by removing the line from Grapevine (50827) to Elk City (54153). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT121PH	Single phase fault and sequence like Cont. No. 11

Cont. No.	Cont. Name	Description
13	FLT133PH	Fault on the Nichols (50915) to Grapevine (50827), 230 kV line, (at Mid Line). Establish a new bus (Mid-Line Bus) in the electrical middle of the 345 kV line. a. Apply Fault at the Mid-line bus (899). b. Clear Fault after 5 cycles by removing the line from Nichols (50915) to Mid-line bus (899) and from Mid-line bus (899) to Grapevine (50827). c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT141PH	Single phase fault and sequence like Cont. No. 13
15	FLT153PH	Fault on the Nichols (50915) to Hutchison County Interchange (50751), 230 kV line, near Hutchison County Interchange. a. Apply Fault at the Hutchison County Interchange bus (50751). b. Clear fault after 5 cycles by removing the line from Nichols (50915) to Hutchison County Interchange (50751). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT161PH	Single phase fault and sequence like Cont. No. 15
17	FLT173PH	Fault on the Nichols (50915) to Whitaker (50922), 115 kV line, near Whitaker a. Apply Fault at the Whitaker bus (50922). b. Clear fault after 5 cycles by removing the line from Nichols (50915) to Whitaker (50922). c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT181PH	Single phase fault and sequence like Cont. No. 17
19	FLT193PH	Fault on the Whitaker (50922) to East Plant Interchange (50956), 115 kV line, near East Plant Interchange a. Apply Fault at the East Plant Interchange bus (50956). b. Clear fault after 5 cycles by removing the line from Whitaker (50922) to East Plant Interchange (50956).

Cont. No.	Cont. Name	Description
		c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20		Single phase fault and sequence like Cont. No. 19

3.4 Simulation Results

Simulations were performed with a 0.1-second steady-state run followed by the appropriate disturbance as described in Table 4. Simulations were run for a minimum 10-second duration to confirm proper machine damping. Based on the obtained simulation results, the system remained stable for all the simulated faults with the proposed 240MW wind farm project in service. All oscillations were well damped. The study finds that the proposed 240MW wind farm project, on the basis of base cases, modeling assumptions described within this report, and for the tested contingencies (on the supplied base cases) show stable performance of SPP system.

A complete set of the transient stability plots for rotor angle, speed, and voltages for the monitored buses in SPP for all contingencies for the two base cases with the proposed 240MW wind farm in service, are in an electronic format on the accompanying CD.

Sample plots for rotor angle, speed, and voltages for disturbances #1 and #11 for summer peak load and for disturbance #17 for fall loading conditions are included in Appendix A.

From the simulation results obtained, the following conclusions can be made:

- For peak summer loading condition, the wind farm tripped due to relay actuation in disturbances #1 and #2 (3-phase and 1-phase faults respectively, at Kirby 115kV bus. See Table 4 for complete descriptions).Tripping of the wind farm because of these specific contingencies is normal since the fault clearing procedures require tripping of Conway115kV at which the proposed 240MW wind farm is connected. In fact, tripping of the wind farm should be considered as part of the fault clearing procedures.

- For fall loading condition, tripping of the wind farm occurred in disturbance # 17 (3-phase fault at Whitaker on Nichols to Whitaker 115kV line. See Table 4 for complete descriptions) in addition to the two disturbances #1 and #2 as in the summer case. Tripping of the wind farm for disturbance # 17 was mainly due to the actuation of the over frequency relay because of high frequency excursion. It was found out that the amplitude of the frequency excursion in

the fall base case is higher than that in the summer base case because of the lesser system inertia.

All oscillations were well damped. The study finds that the proposed 240MW wind farm project shows stable performance of SPP system for the contingencies tested on the supplied base cases.

4. Conclusion

The stability simulation findings of the impact study of a proposed interconnection (Gen-2004-003) were presented in this report. The study was conducted through the Southwest Power Pool Tariff for a 115kV 240 MW wind farm in Carson County, Texas. This wind farm would be interconnected to the existing Conway district substation via a new 115 kV Main breaker. The Conway district substation is owned by Xcel Energy (d/b/a SWPS). The wind farm is using GE 1.5 MW wind turbines with the standard ride through package.

The 2009 summer and fall load flow cases together with the necessary data needed for the transient stability simulations were provided by SPP. Transient stability simulations were conducted with the proposed wind farm in service with a full output of 240 MW. In order to integrate the proposed 240MW wind farm in SPP system, re-dispatch for the existing SPP footprint generation was provided by SPP.

Twenty (20) contingencies were considered for the transient stability simulations which included three phase faults, as well as single line to ground faults, at the locations defined by SPP. 1-phase faults were simulated by applying a fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

The proposed wind generators were modeled with voltage/frequency ride through protection. The settings of both under/over voltage and frequency relays were in accordance with standard or default settings.

The simulations conducted in the study did not find any angular or voltage instability problems for the twenty contingencies. However, tripping of the wind farm was observed as follow:

- For peak summer loading condition, the wind farm tripped due to relay actuation in disturbances #1 and #2 (3-phase and 1-phase faults respectively, at Kirby 115kV bus).Tripping of the wind farm because of these specific contingencies is normal since the fault clearing procedures require tripping of Conway115kV at which the proposed 240MW wind farm is connected.

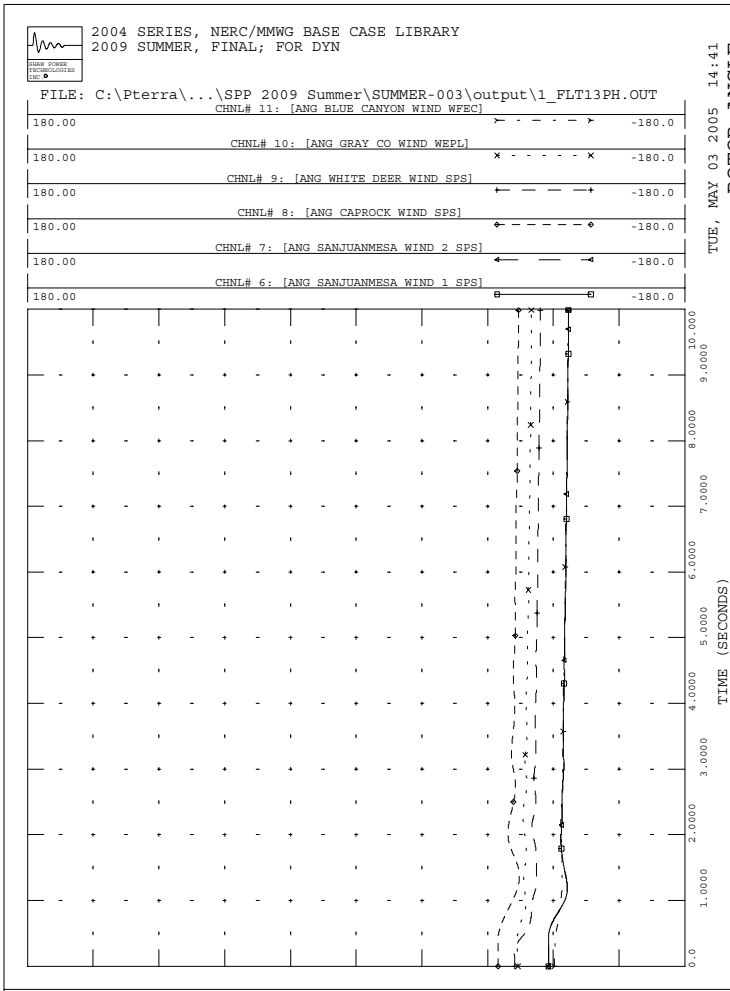
- For fall loading condition, tripping of the wind farm occurred in disturbance # 17 (3-phase fault at Whitaker on Nichols to Whitaker 115kV line) in addition to the two disturbances #1 and #2 as in the summer case. Tripping of the wind farm for disturbance # 17 was mainly due to the actuation of the over frequency relay because of high frequency excursion. It was found out that the amplitude of the frequency excursion in the fall base case is higher than that in the summer base case because of the lesser system inertia.

All oscillations were well damped. The study finds that the proposed 240MW wind farm project shows stable performance of SPP system for the contingencies tested on the supplied base cases.

Appendix A

A-1 Sample Plots for Rotor Angle, Voltage, and Speed for Summer Peak

1. Disturbance #1 (Fault on the Nichols to Kirby, 115 kV line, near Kirby)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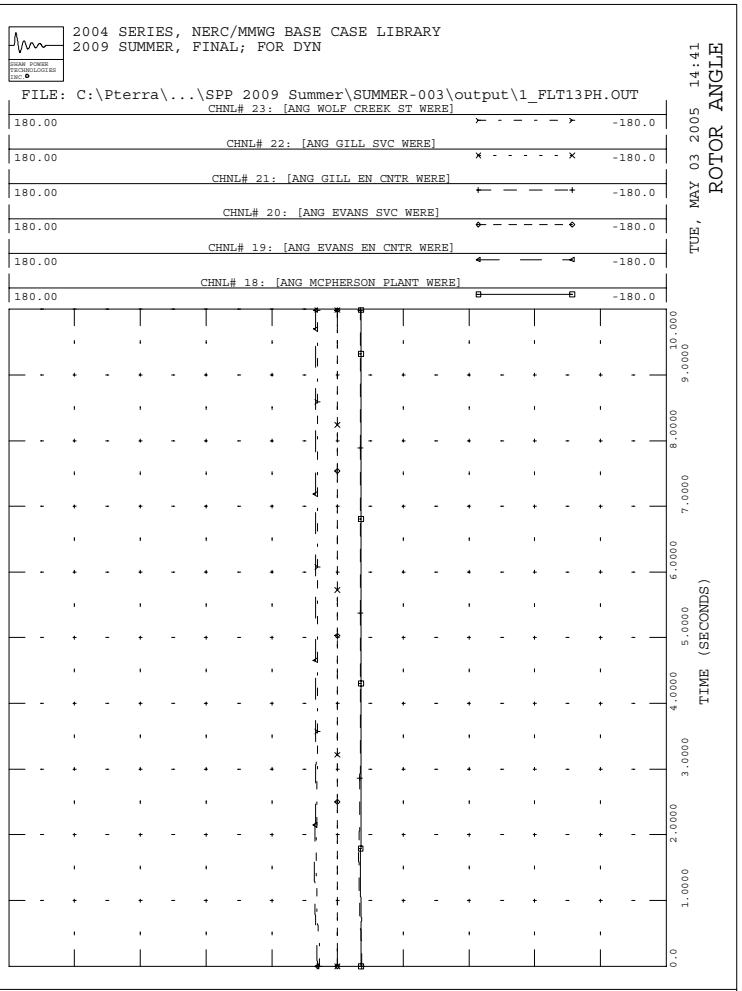
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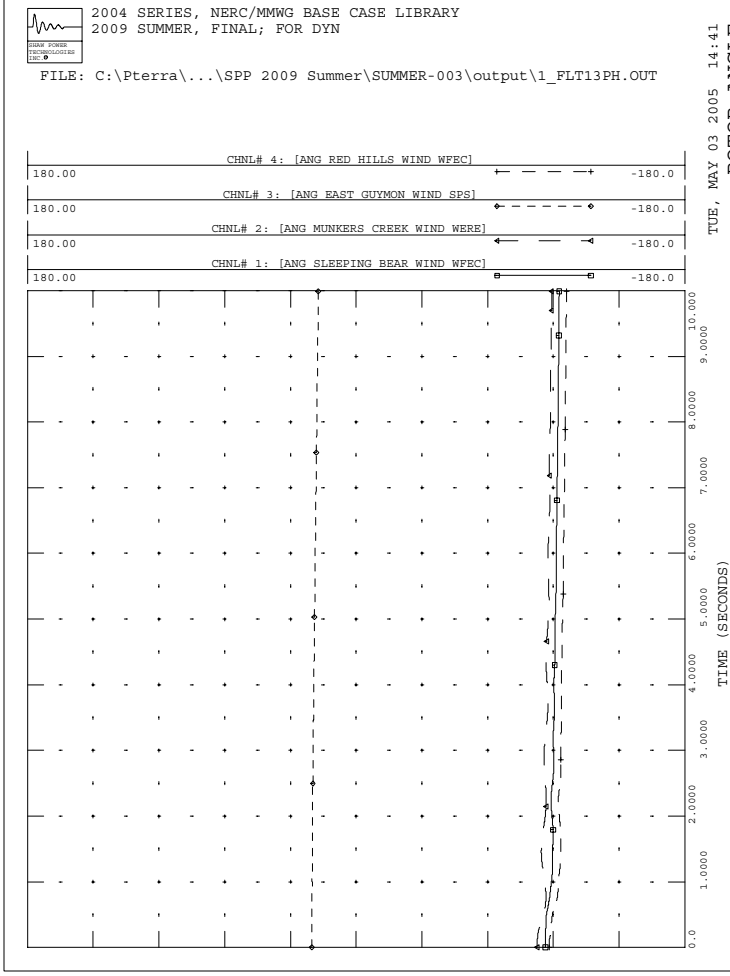
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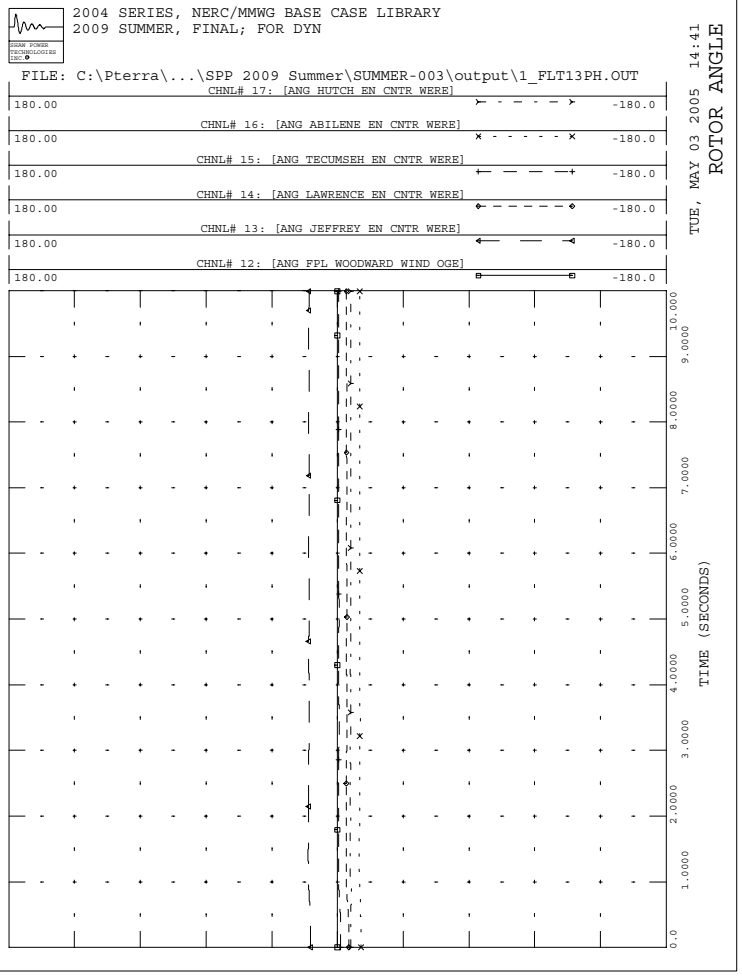
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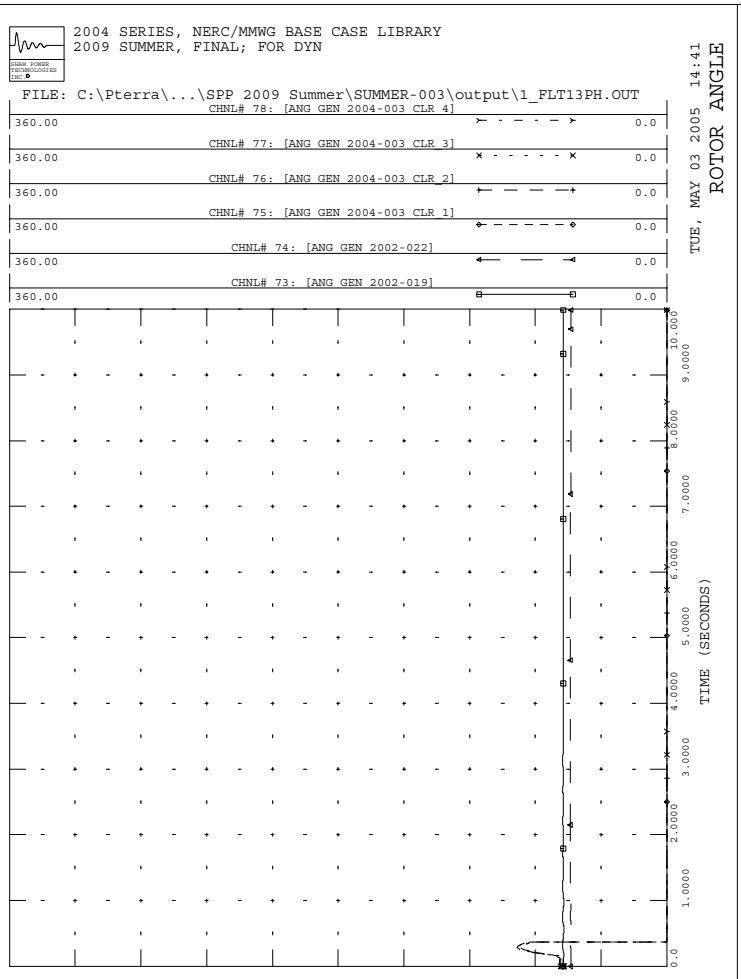
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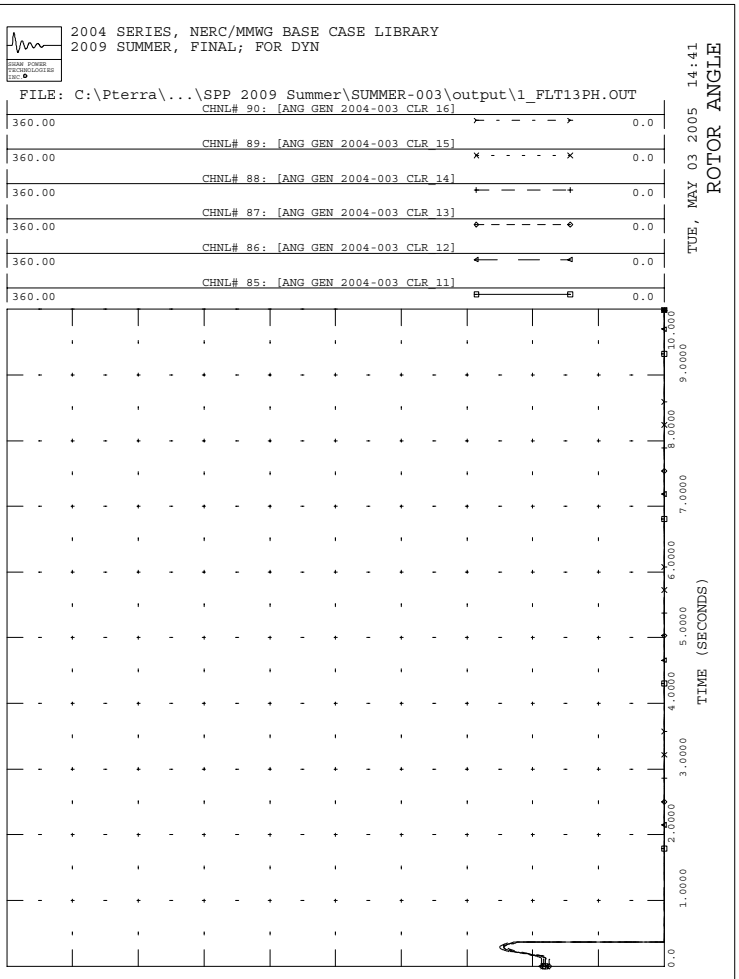
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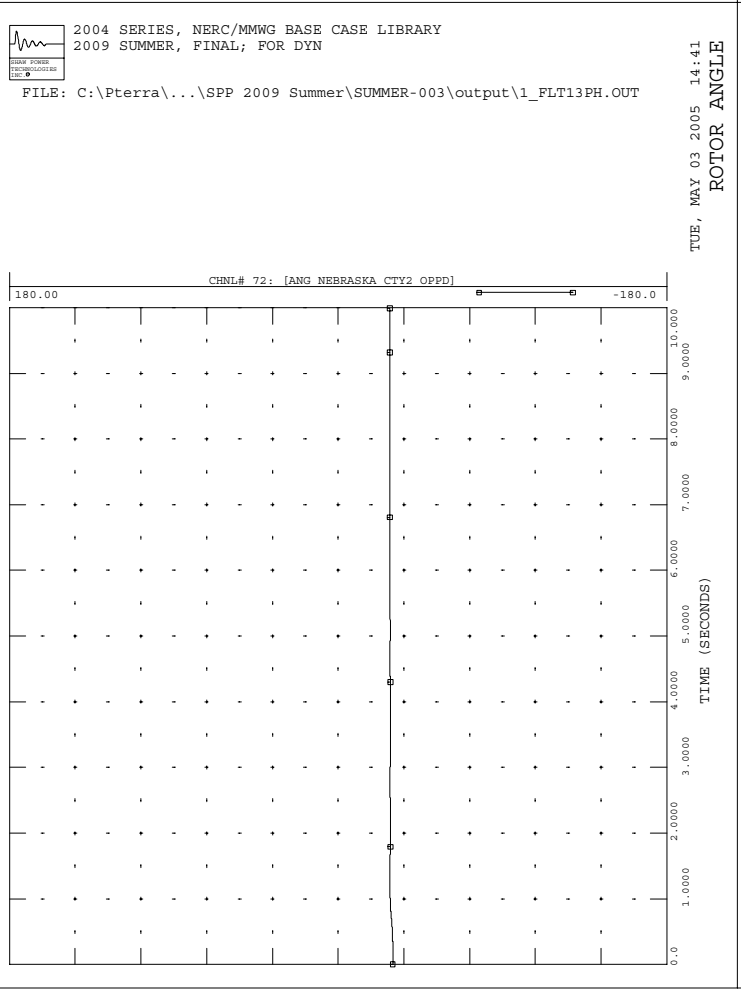
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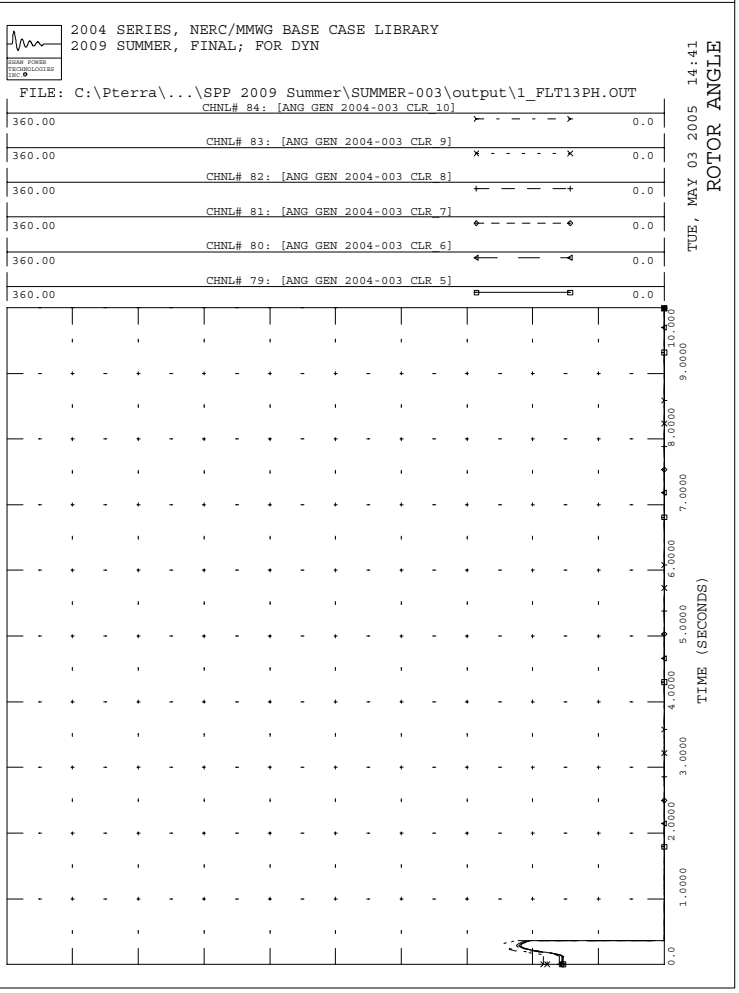
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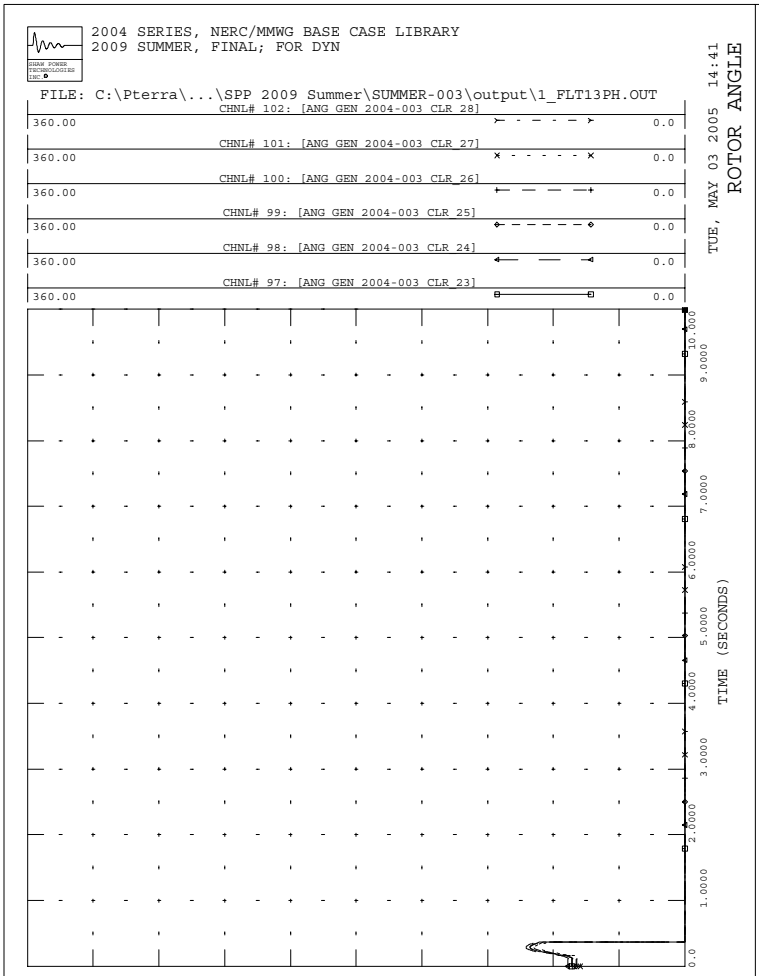
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
TUE, MAY 03 2005 14:41
ROTOR ANGLE
CHNL# 102: [ANG GEN 2004-003 CLR 28]
CHNL# 101: [ANG GEN 2004-003 CLR 27]
CHNL# 100: [ANG GEN 2004-003 CLR 26]
CHNL# 99: [ANG GEN 2004-003 CLR 25]
CHNL# 98: [ANG GEN 2004-003 CLR 24]
CHNL# 97: [ANG GEN 2004-003 CLR 23]
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TIME (SECONDS)
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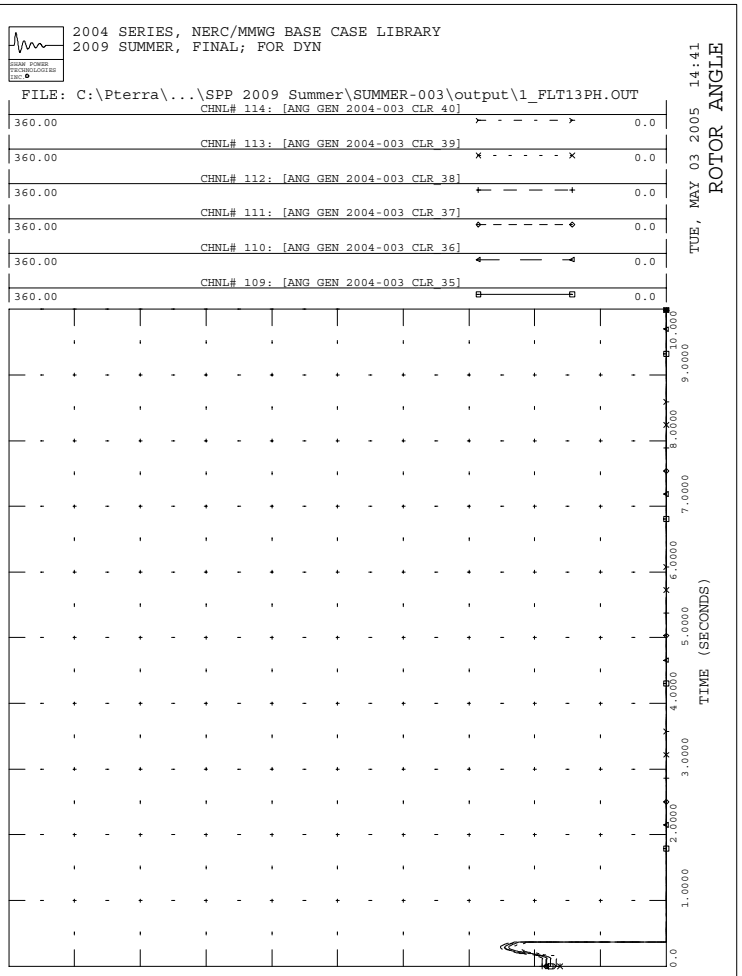
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
TUE, MAY 03 2005 14:41
ROTOR ANGLE
CHNL# 114: [ANG GEN 2004-003 CLR 40]
CHNL# 113: [ANG GEN 2004-003 CLR 39]
CHNL# 112: [ANG GEN 2004-003 CLR 38]
CHNL# 111: [ANG GEN 2004-003 CLR 37]
CHNL# 110: [ANG GEN 2004-003 CLR 36]
CHNL# 109: [ANG GEN 2004-003 CLR 35]
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0.0
TIME (SECONDS)
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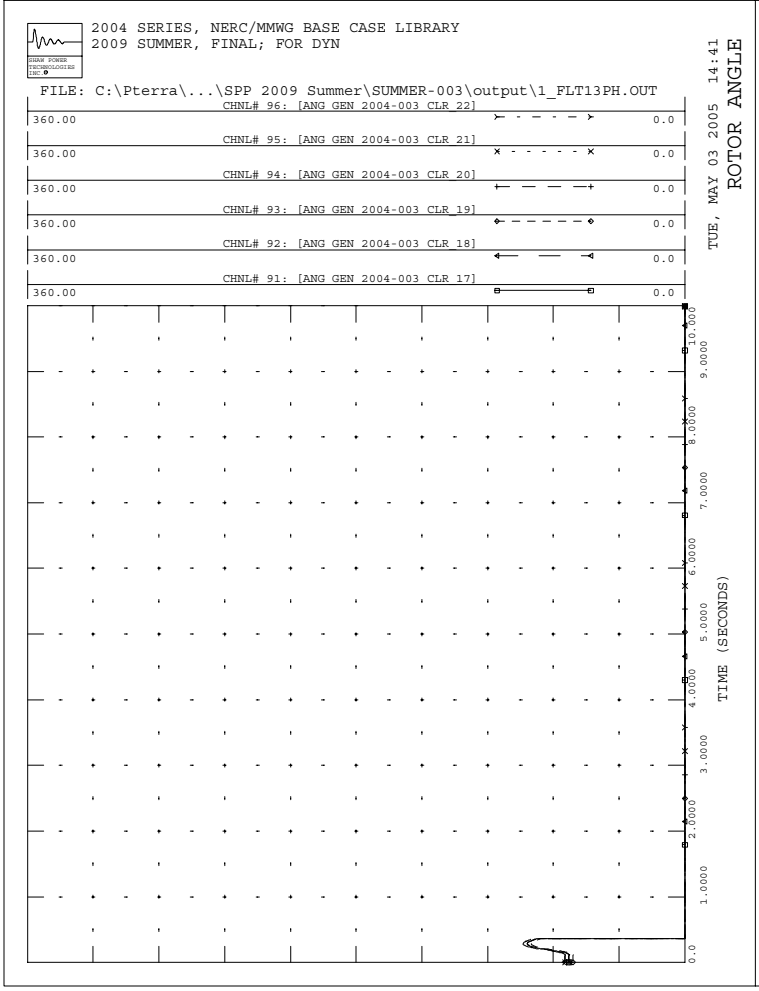
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
TUE, MAY 03 2005 14:41
ROTOR ANGLE
CHNL# 96: [ANG GEN 2004-003 CLR 22]
CHNL# 95: [ANG GEN 2004-003 CLR 21]
CHNL# 94: [ANG GEN 2004-003 CLR 20]
CHNL# 93: [ANG GEN 2004-003 CLR 19]
CHNL# 92: [ANG GEN 2004-003 CLR 18]
CHNL# 91: [ANG GEN 2004-003 CLR 17]
360.00
0.0
TIME (SECONDS)
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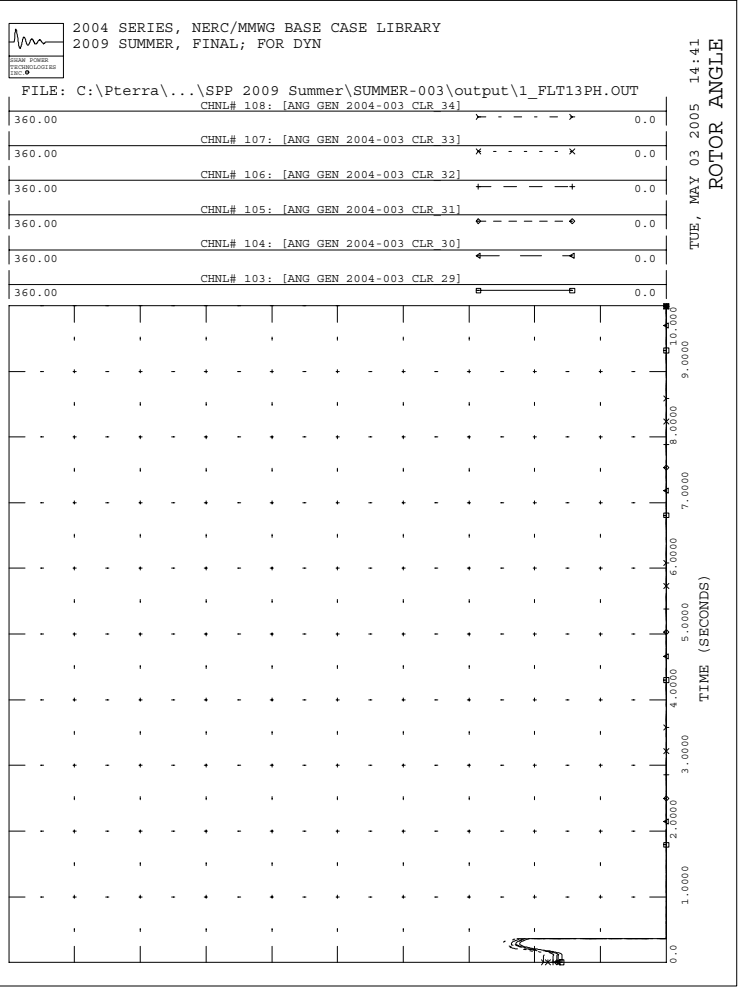
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
TUE, MAY 03 2005 14:41
ROTOR ANGLE
CHNL# 108: [ANG GEN 2004-003 CLR 34]
CHNL# 107: [ANG GEN 2004-003 CLR 33]
CHNL# 106: [ANG GEN 2004-003 CLR 32]
CHNL# 105: [ANG GEN 2004-003 CLR 31]
CHNL# 104: [ANG GEN 2004-003 CLR 30]
CHNL# 103: [ANG GEN 2004-003 CLR 29]
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0.0
TIME (SECONDS)
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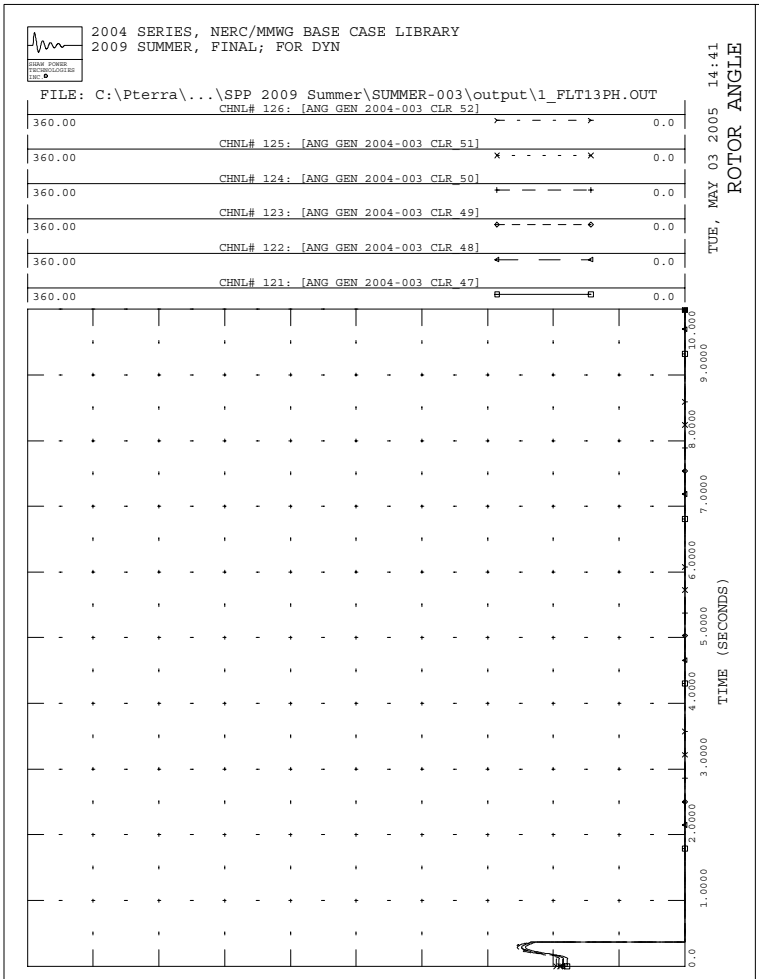
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 126: [ANG GEN 2004-003 CLR 52]
CHNL# 125: [ANG GEN 2004-003 CLR 51]
CHNL# 124: [ANG GEN 2004-003 CLR 50]
CHNL# 123: [ANG GEN 2004-003 CLR 49]
CHNL# 122: [ANG GEN 2004-003 CLR 48]
CHNL# 121: [ANG GEN 2004-003 CLR 47]
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TUE, MAY 03 2005 14:41
ROTOR ANGLE
TIME (SECONDS)
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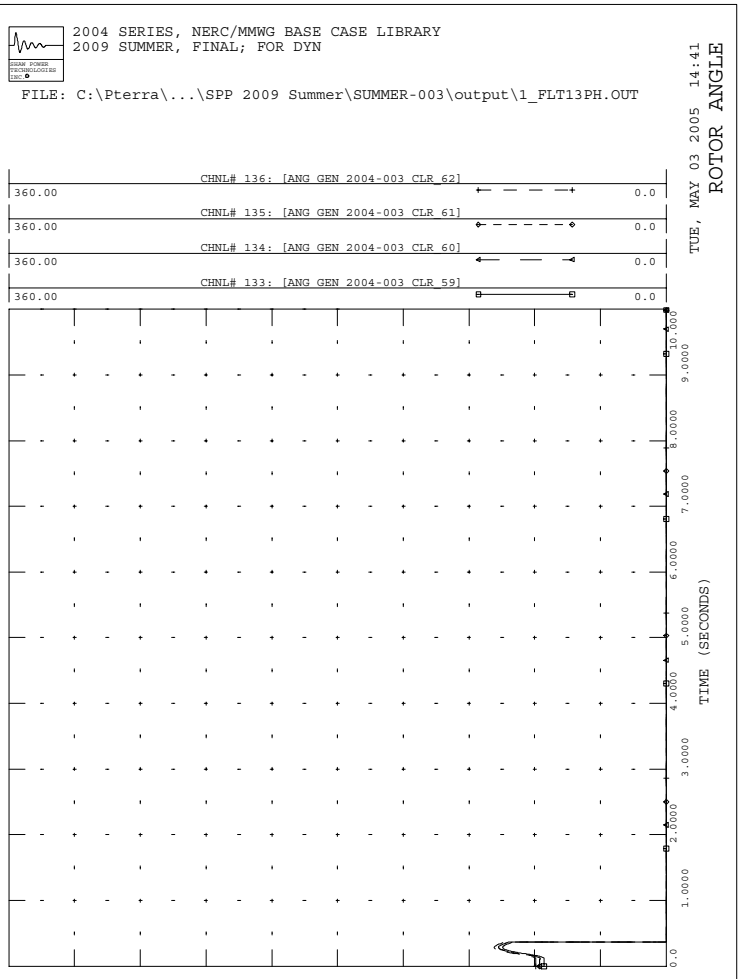
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 136: [ANG GEN 2004-003 CLR 62]
CHNL# 135: [ANG GEN 2004-003 CLR 61]
CHNL# 134: [ANG GEN 2004-003 CLR 60]
CHNL# 133: [ANG GEN 2004-003 CLR 59]
360.00
0.0
TUE, MAY 03 2005 14:41
ROTOR ANGLE
TIME (SECONDS)
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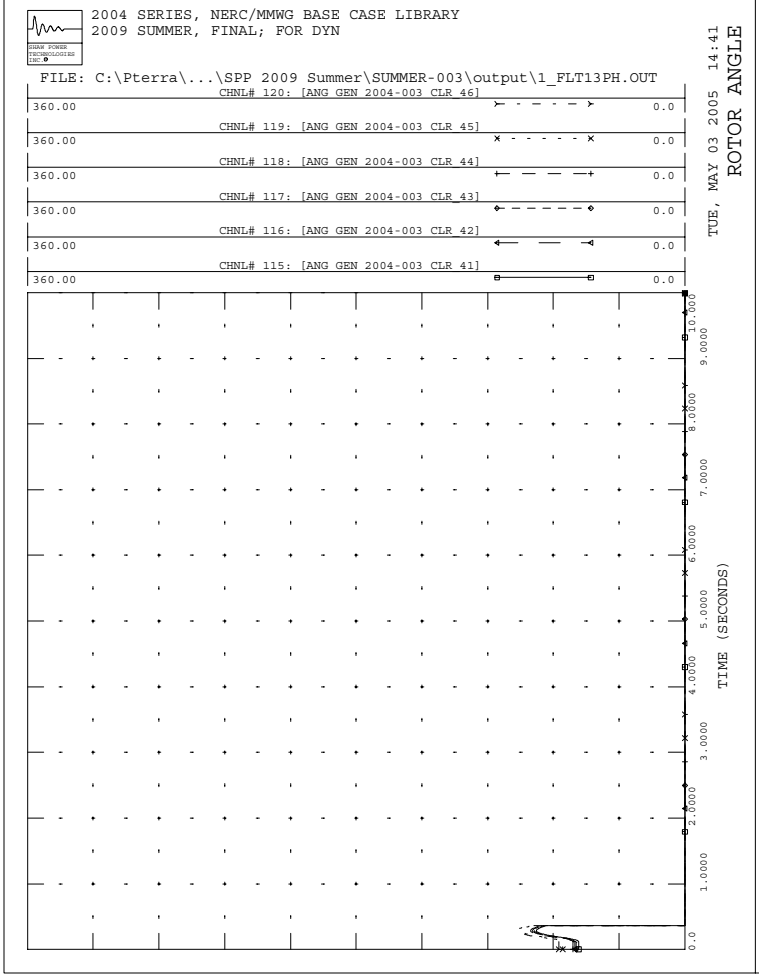
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 120: [ANG GEN 2004-003 CLR 46]
CHNL# 119: [ANG GEN 2004-003 CLR 45]
CHNL# 118: [ANG GEN 2004-003 CLR 44]
CHNL# 117: [ANG GEN 2004-003 CLR 43]
CHNL# 116: [ANG GEN 2004-003 CLR 42]
CHNL# 115: [ANG GEN 2004-003 CLR 41]
360.00
0.0
TUE, MAY 03 2005 14:41
ROTOR ANGLE
TIME (SECONDS)
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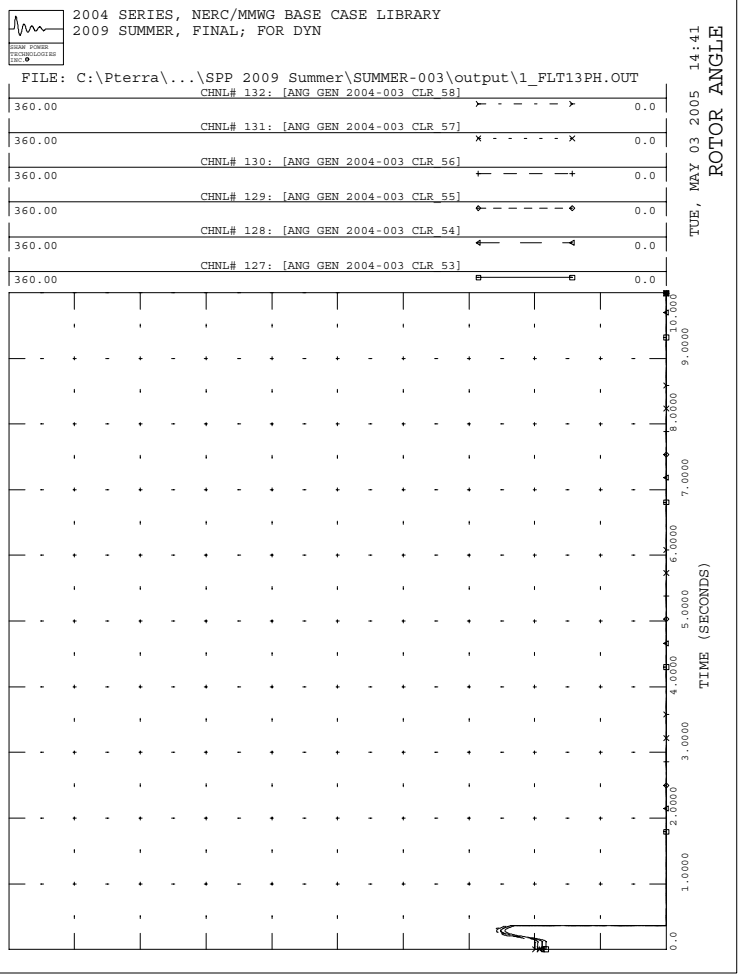
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 132: [ANG GEN 2004-003 CLR 58]
CHNL# 131: [ANG GEN 2004-003 CLR 57]
CHNL# 130: [ANG GEN 2004-003 CLR 56]
CHNL# 129: [ANG GEN 2004-003 CLR 55]
CHNL# 128: [ANG GEN 2004-003 CLR 54]
CHNL# 127: [ANG GEN 2004-003 CLR 53]
360.00
0.0
TUE, MAY 03 2005 14:41
ROTOR ANGLE
TIME (SECONDS)
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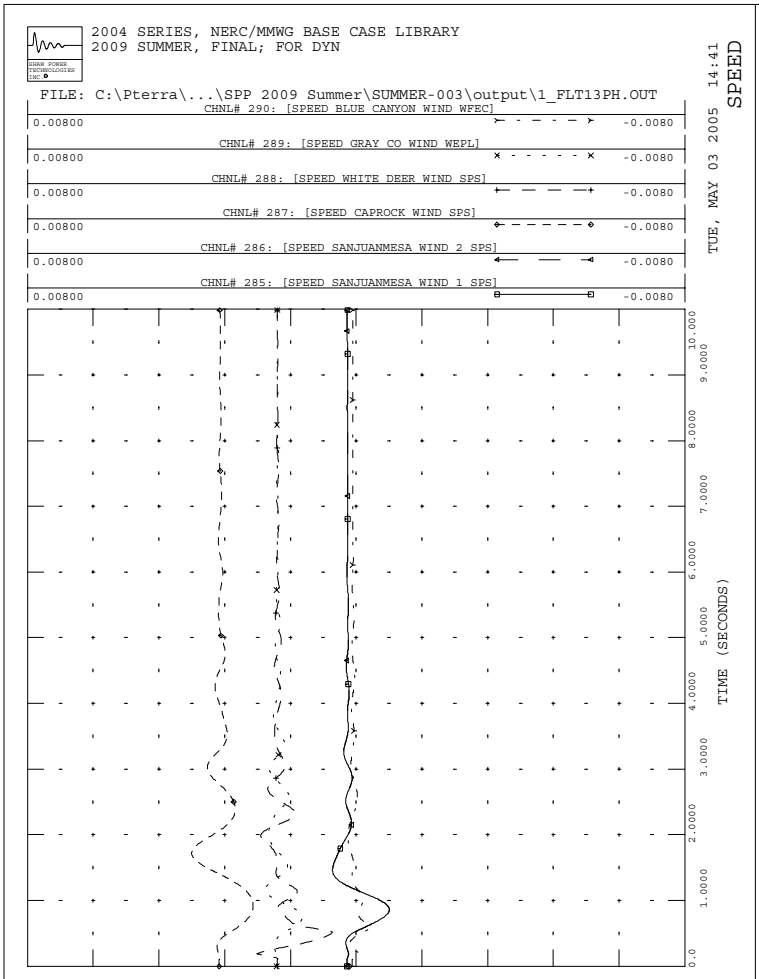
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 290: [SPEED BLUE CANYON WIND WFEC]
CHNL# 289: [SPEED GRAY CO WIND WEPL]
CHNL# 288: [SPEED WHITE DEER WIND SPS]
CHNL# 287: [SPEED CAPROCK WIND SPS]
CHNL# 286: [SPEED SANJUANMESA WIND 2 SPS]
CHNL# 285: [SPEED SANJUANMESA WIND 1 SPS]
0.00800
-0.0080
TUE, MAY 03 2005 14:41
SPEED
TIME (SECONDS)
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1.0000
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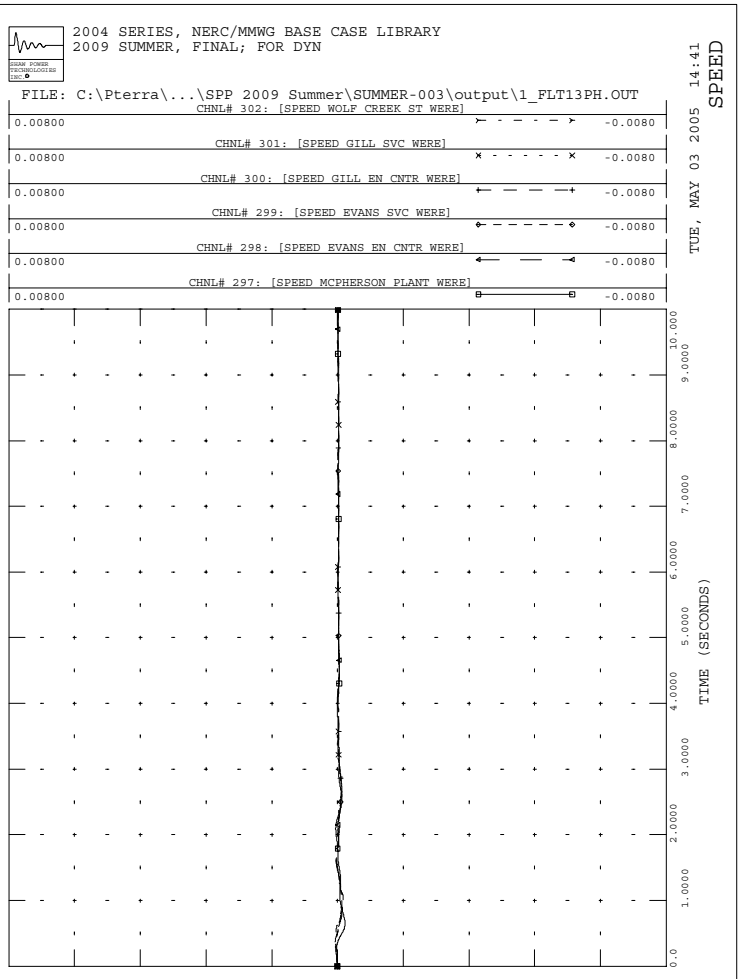
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 302: [SPEED WOLF CREEK ST WERE]
CHNL# 301: [SPEED GILL SVC WERE]
CHNL# 300: [SPEED GILL EN CNTR WERE]
CHNL# 299: [SPEED EVANS SVC WERE]
CHNL# 298: [SPEED EVANS EN CNTR WERE]
CHNL# 297: [SPEED MCPHERSON PLANT WERE]
0.00800
-0.0080
TUE, MAY 03 2005 14:41
SPEED
TIME (SECONDS)
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1.0000
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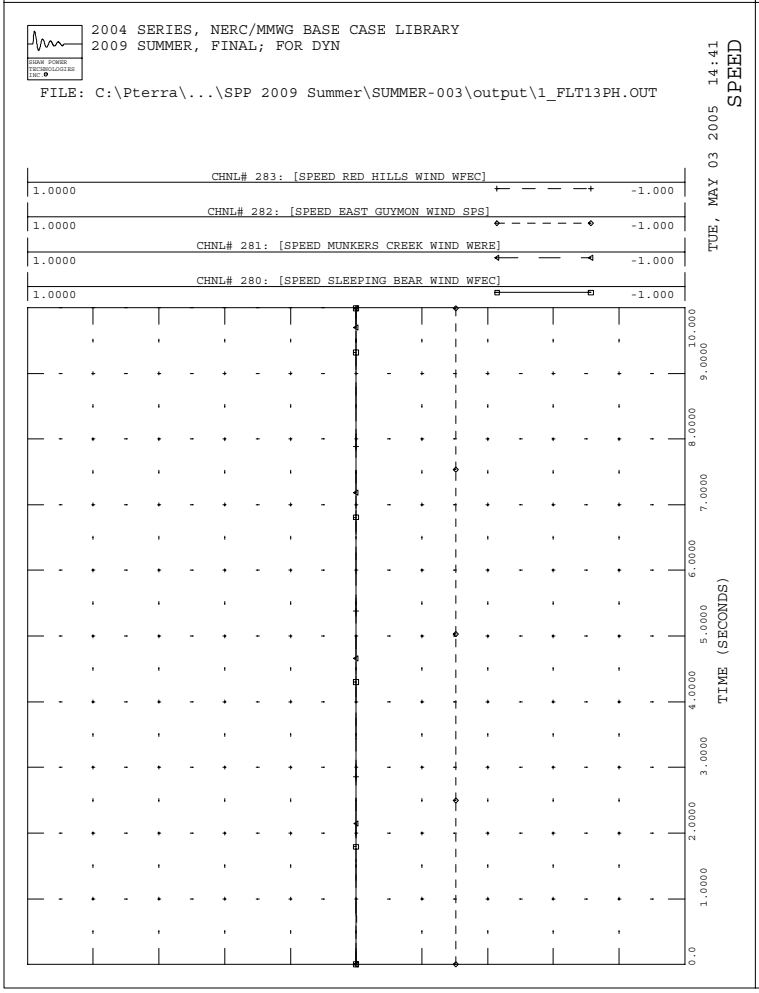
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 283: [SPEED RED HILLS WIND WFEC]
CHNL# 282: [SPEED EAST GUYMON WIND SPS]
CHNL# 281: [SPEED MUNKERS CREEK WIND WERE]
CHNL# 280: [SPEED SLEEPING BEAR WIND WFEC]
1.0000
-1.000
TUE, MAY 03 2005 14:41
SPEED
TIME (SECONDS)
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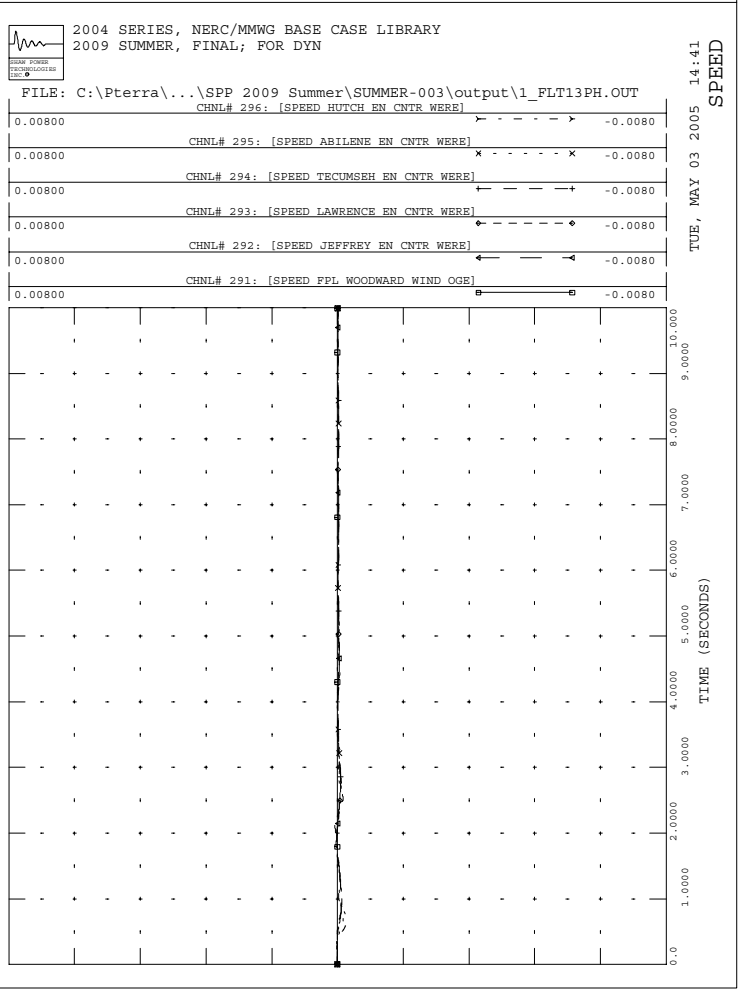
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 296: [SPEED HUTCH EN CNTR WERE]
CHNL# 295: [SPEED ABILENE EN CNTR WERE]
CHNL# 294: [SPEED TECUMSEH EN CNTR WERE]
CHNL# 293: [SPEED LAWRENCE EN CNTR WERE]
CHNL# 292: [SPEED JEFFREY EN CNTR WERE]
CHNL# 291: [SPEED FPL WOODWARD WIND OGE]
0.00800
-0.0080
TUE, MAY 03 2005 14:41
SPEED
TIME (SECONDS)
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1.0000
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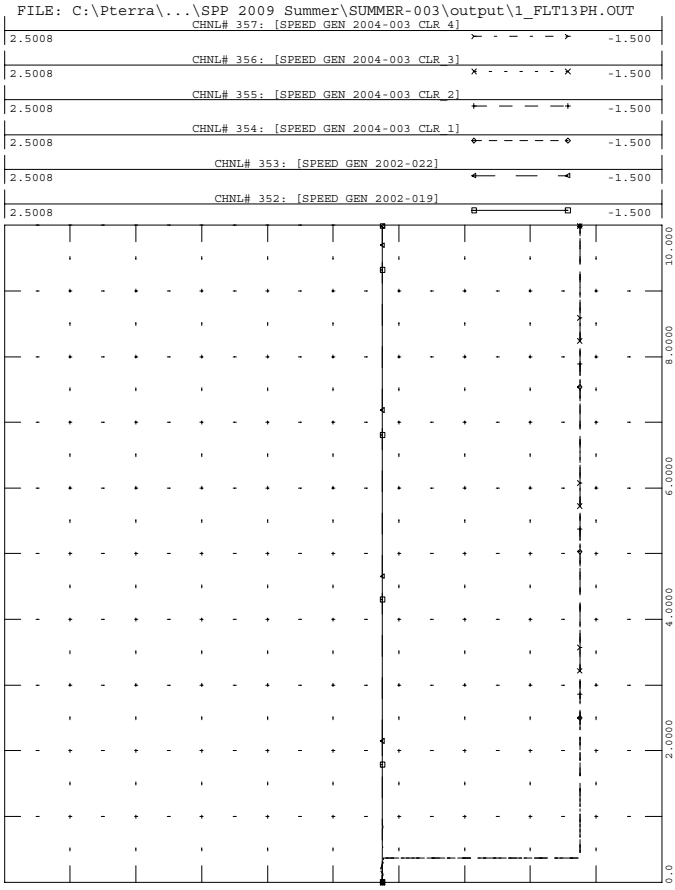
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

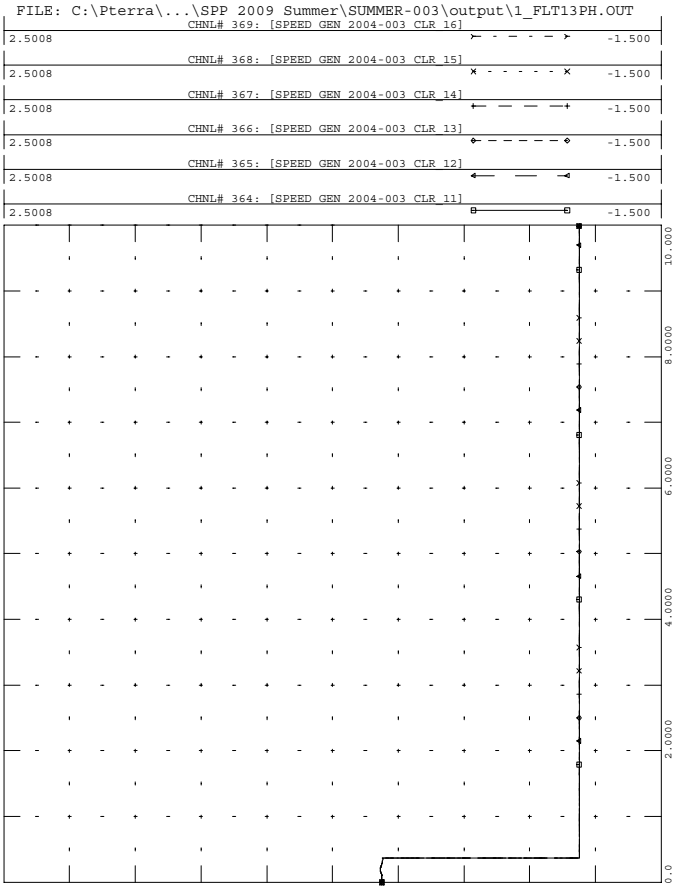
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

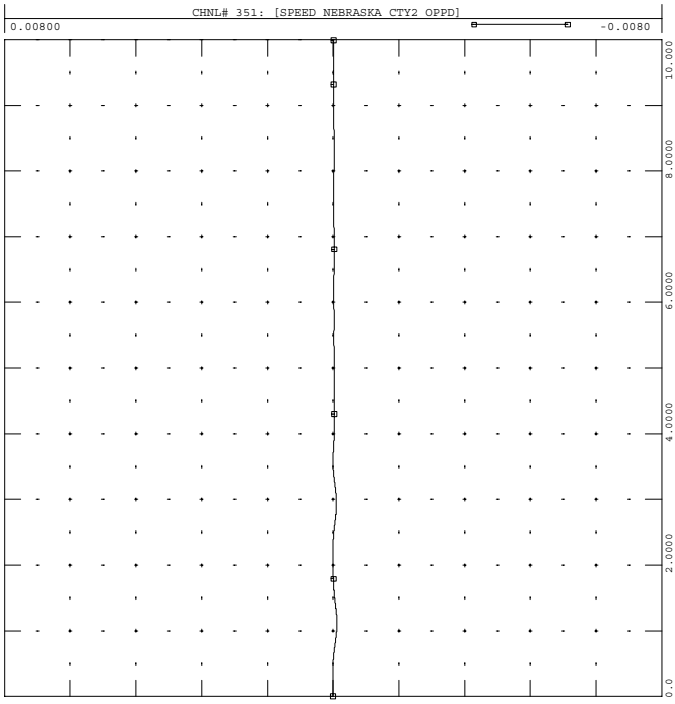
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

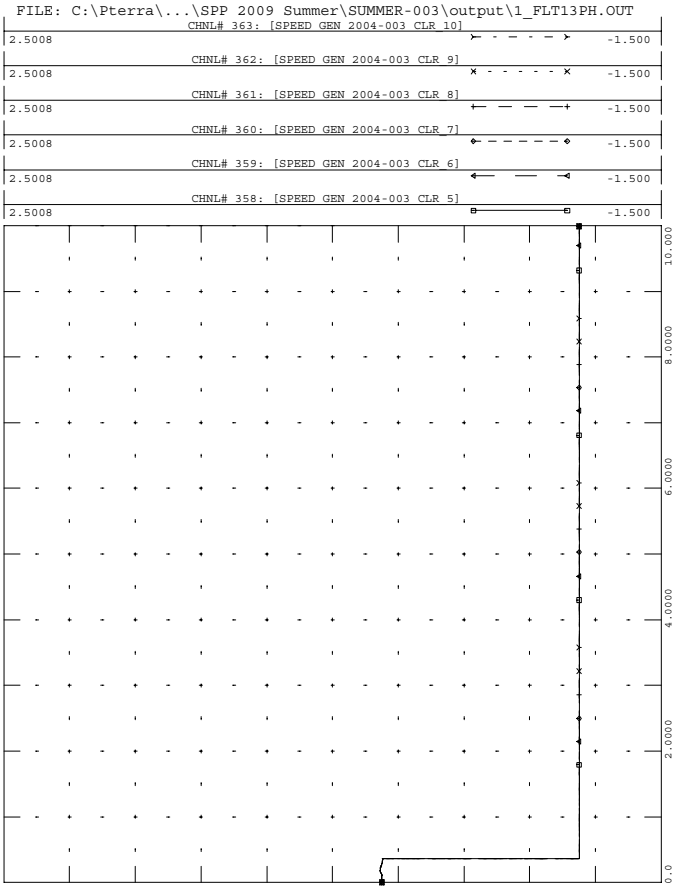
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



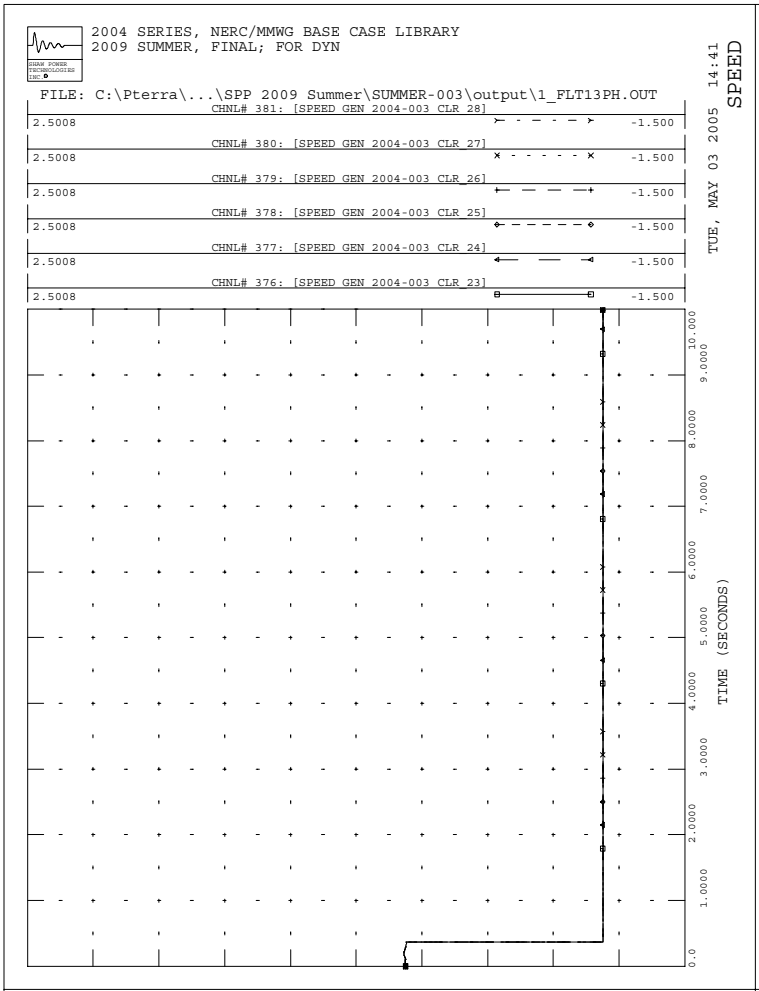
TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SIEMENS POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 381: [SPEED GEN 2004-003 CLR 28]
CHNL# 380: [SPEED GEN 2004-003 CLR 27]
CHNL# 379: [SPEED GEN 2004-003 CLR_26]
CHNL# 378: [SPEED GEN 2004-003 CLR 25]
CHNL# 377: [SPEED GEN 2004-003 CLR 24]
CHNL# 376: [SPEED GEN 2004-003 CLR_23]
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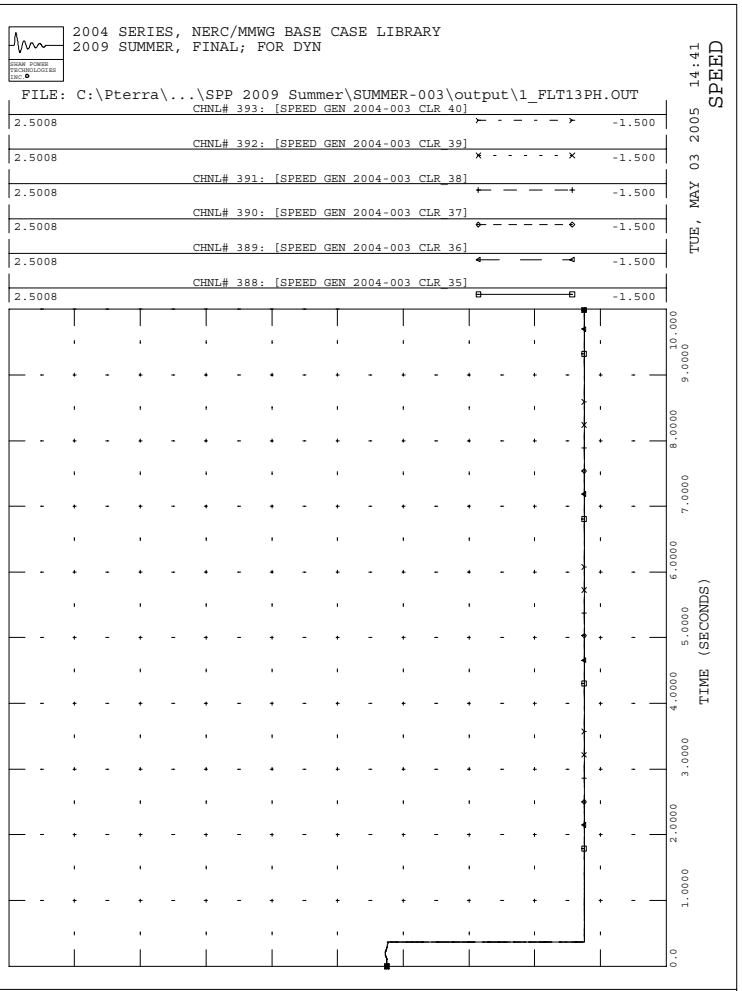
TIME (SECONDS)
TUE, MAY 03 2005 14:41
SPEED


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SIEMENS POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 393: [SPEED GEN 2004-003 CLR 40]
CHNL# 392: [SPEED GEN 2004-003 CLR_39]
CHNL# 391: [SPEED GEN 2004-003 CLR_38]
CHNL# 390: [SPEED GEN 2004-003 CLR 37]
CHNL# 389: [SPEED GEN 2004-003 CLR 36]
CHNL# 388: [SPEED GEN 2004-003 CLR_35]
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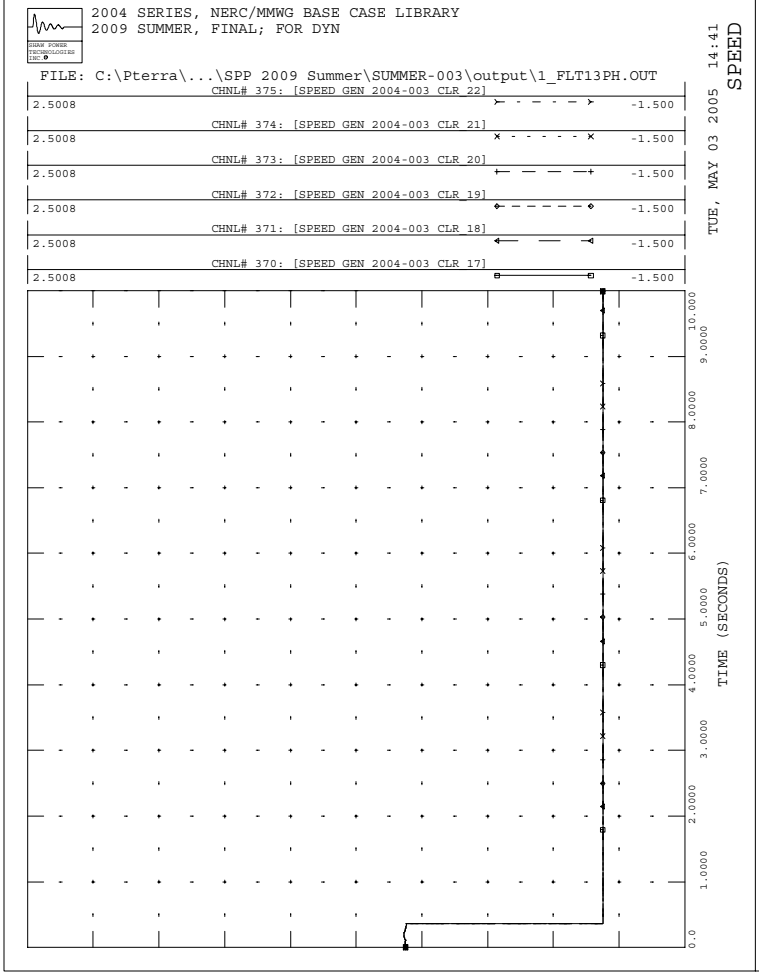
TIME (SECONDS)
TUE, MAY 03 2005 14:41
SPEED


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SIEMENS POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 375: [SPEED GEN 2004-003 CLR 22]
CHNL# 374: [SPEED GEN 2004-003 CLR 21]
CHNL# 373: [SPEED GEN 2004-003 CLR 20]
CHNL# 372: [SPEED GEN 2004-003 CLR_19]
CHNL# 371: [SPEED GEN 2004-003 CLR_18]
CHNL# 370: [SPEED GEN 2004-003 CLR_17]
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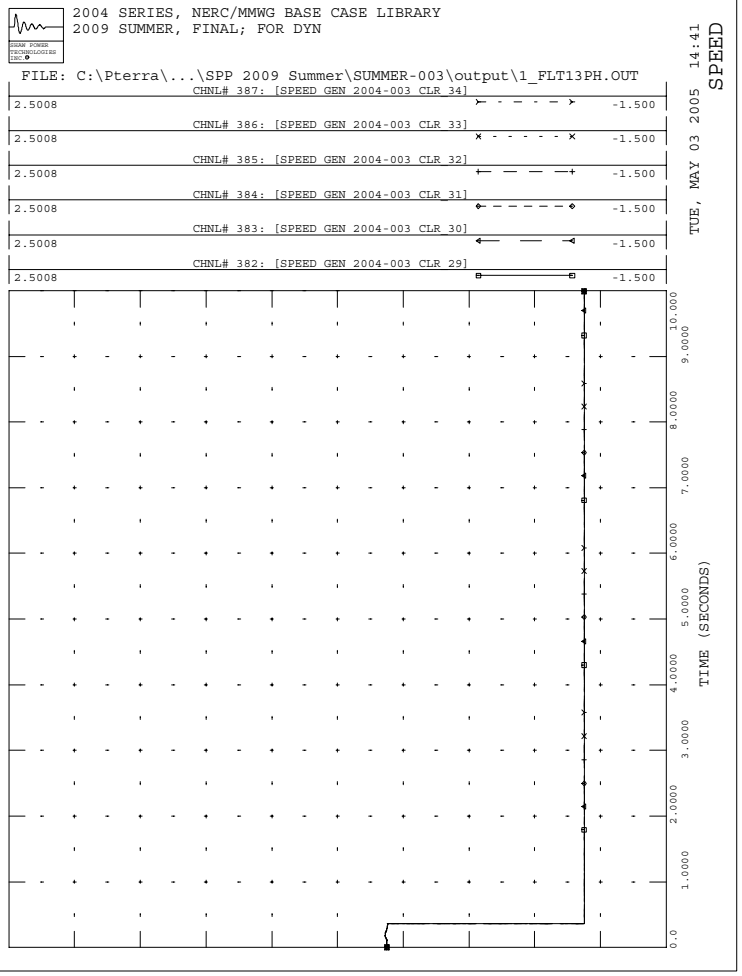
TIME (SECONDS)
TUE, MAY 03 2005 14:41
SPEED


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SIEMENS POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 387: [SPEED GEN 2004-003 CLR 34]
CHNL# 386: [SPEED GEN 2004-003 CLR 33]
CHNL# 385: [SPEED GEN 2004-003 CLR 32]
CHNL# 384: [SPEED GEN 2004-003 CLR_31]
CHNL# 383: [SPEED GEN 2004-003 CLR_30]
CHNL# 382: [SPEED GEN 2004-003 CLR_29]
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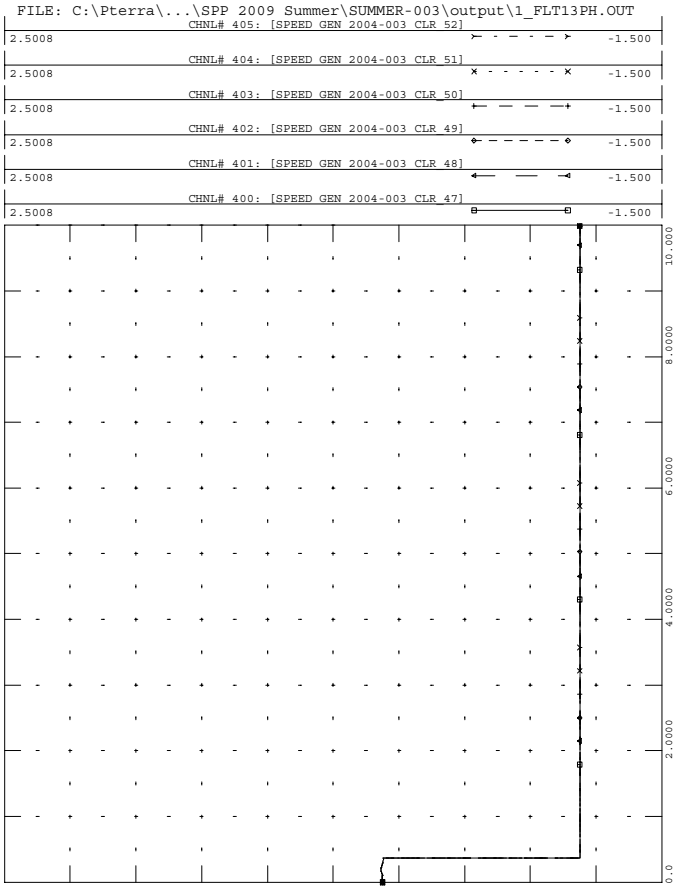
TIME (SECONDS)
TUE, MAY 03 2005 14:41
SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

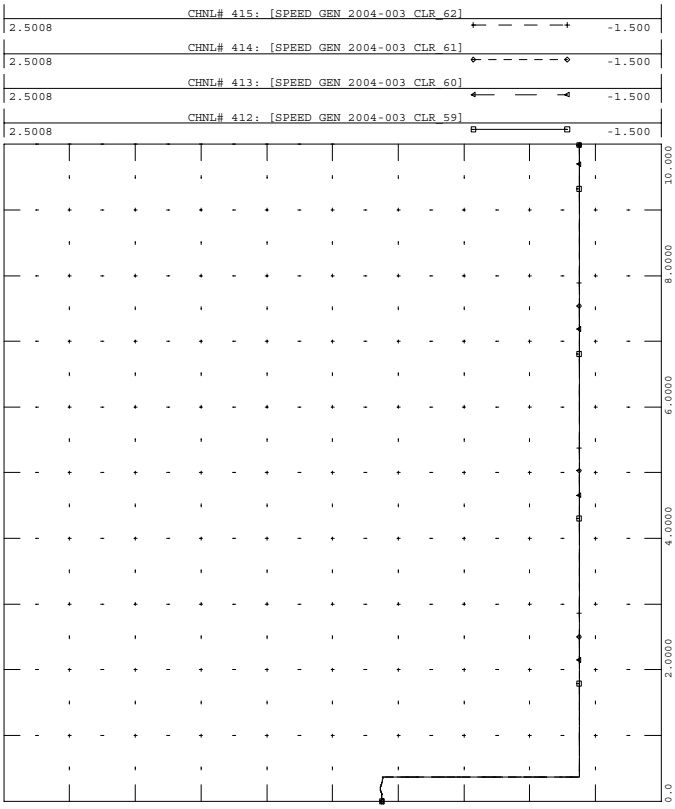
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

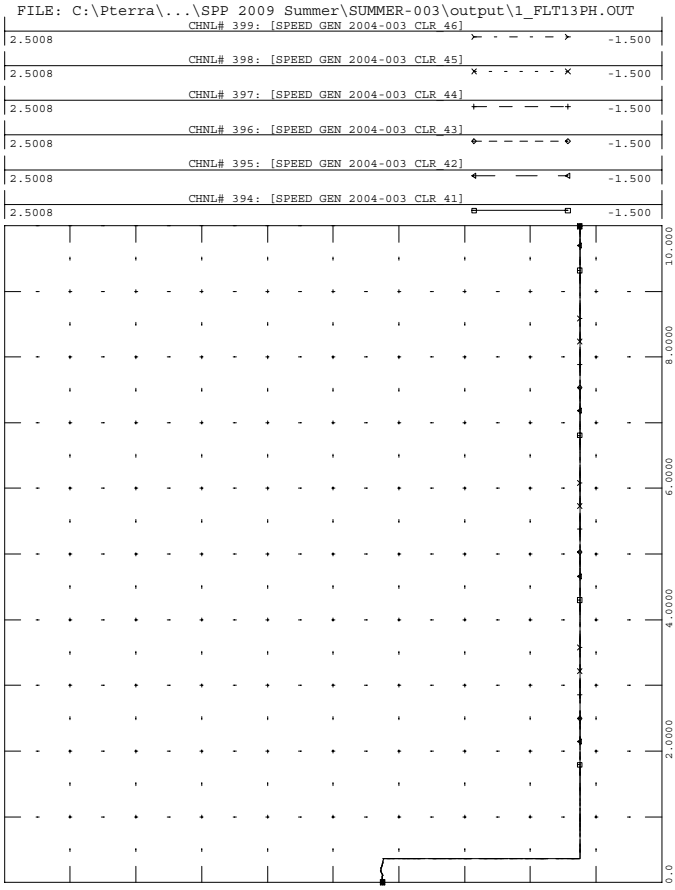
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

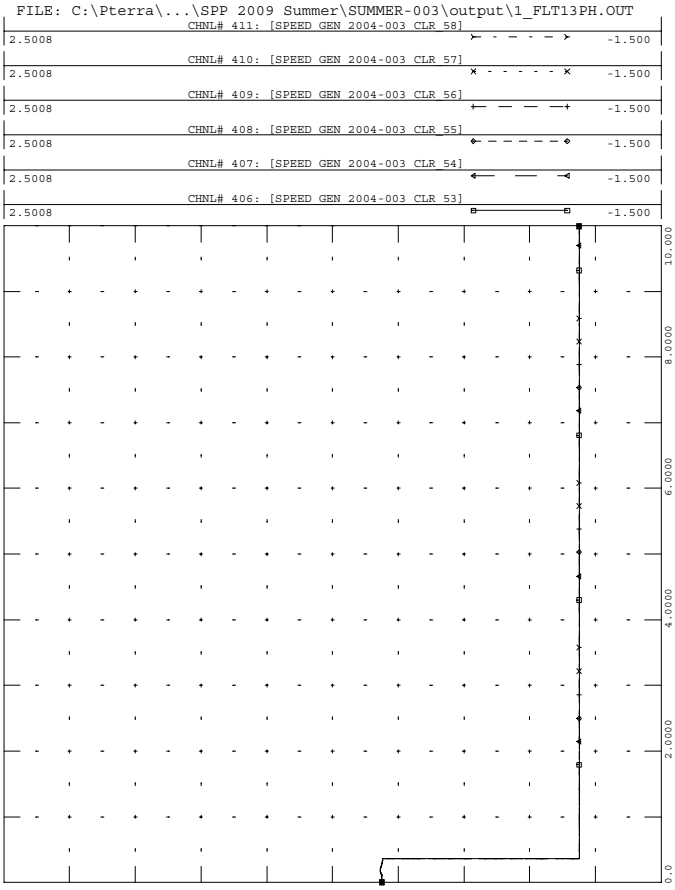
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

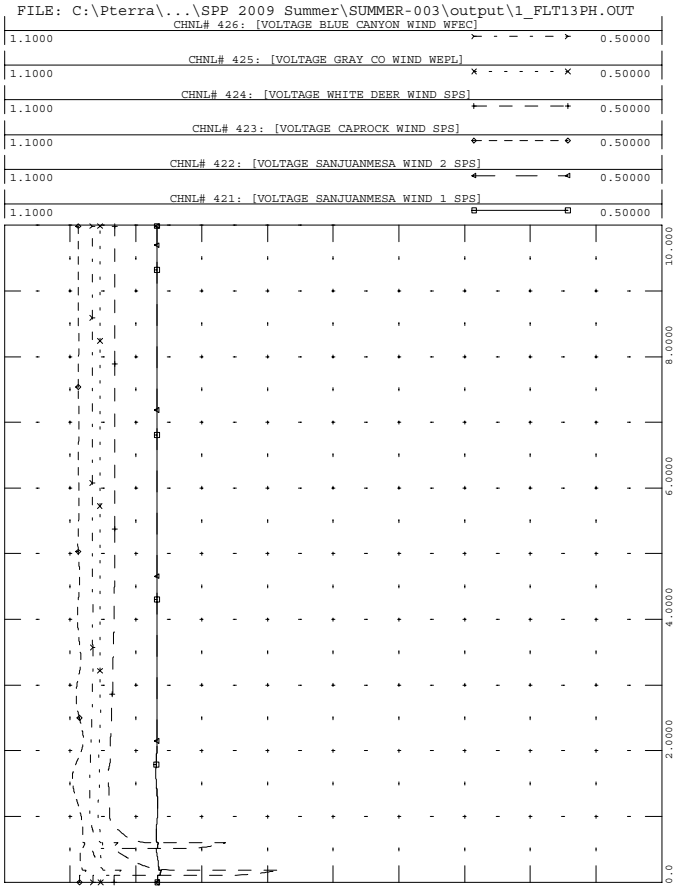
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:41 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

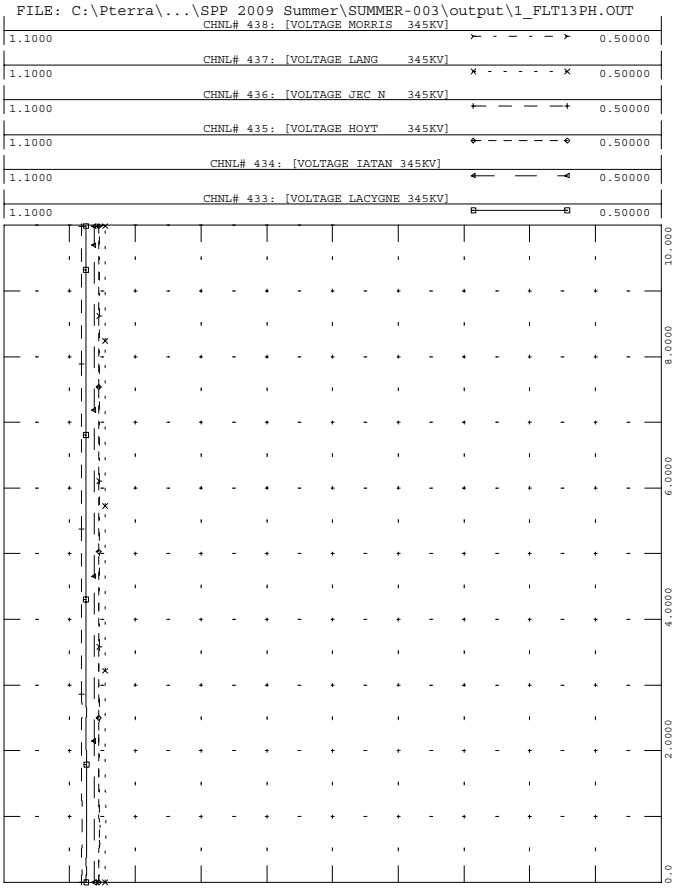
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:42
VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT



TUE, MAY 03 2005 14:42
VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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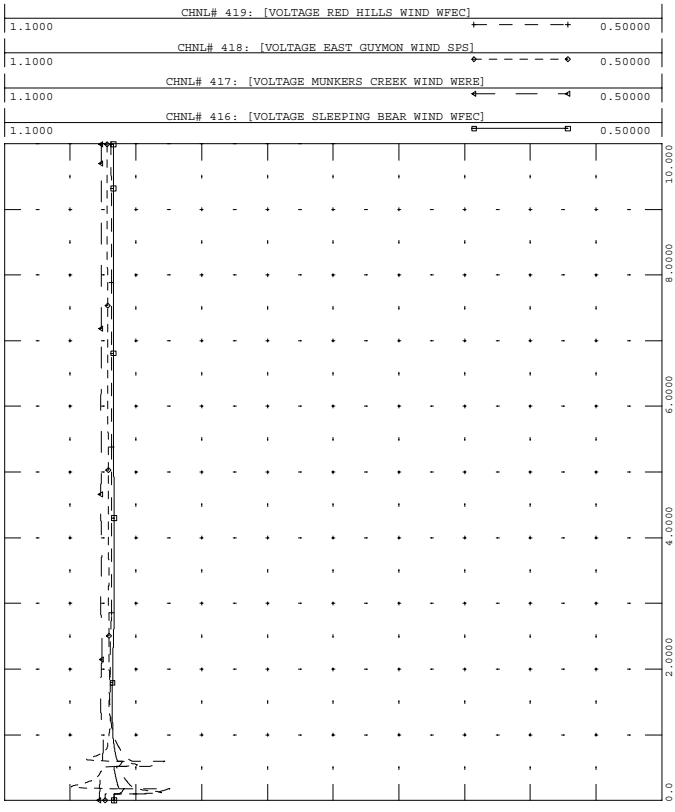

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2009 SUMMER, FINAL; FOR DYN

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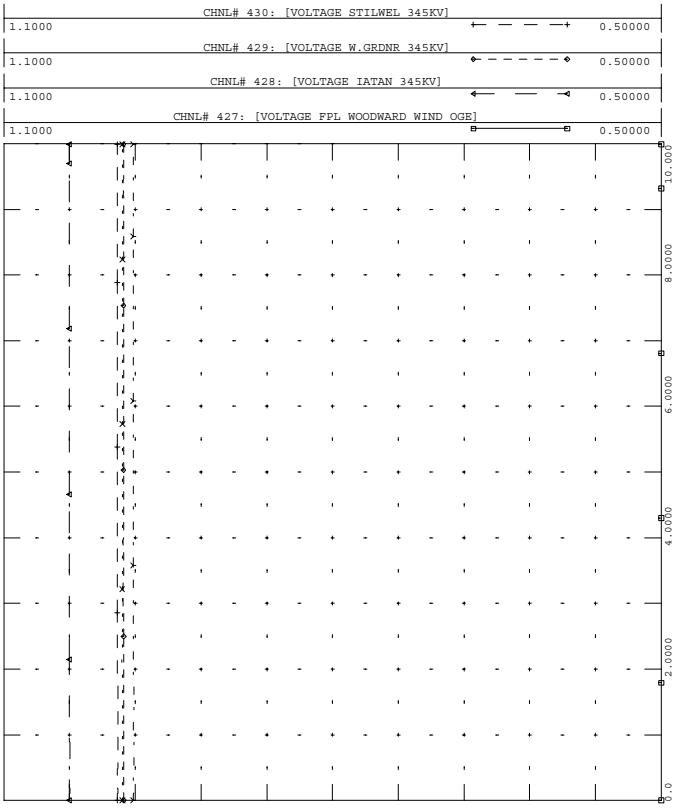

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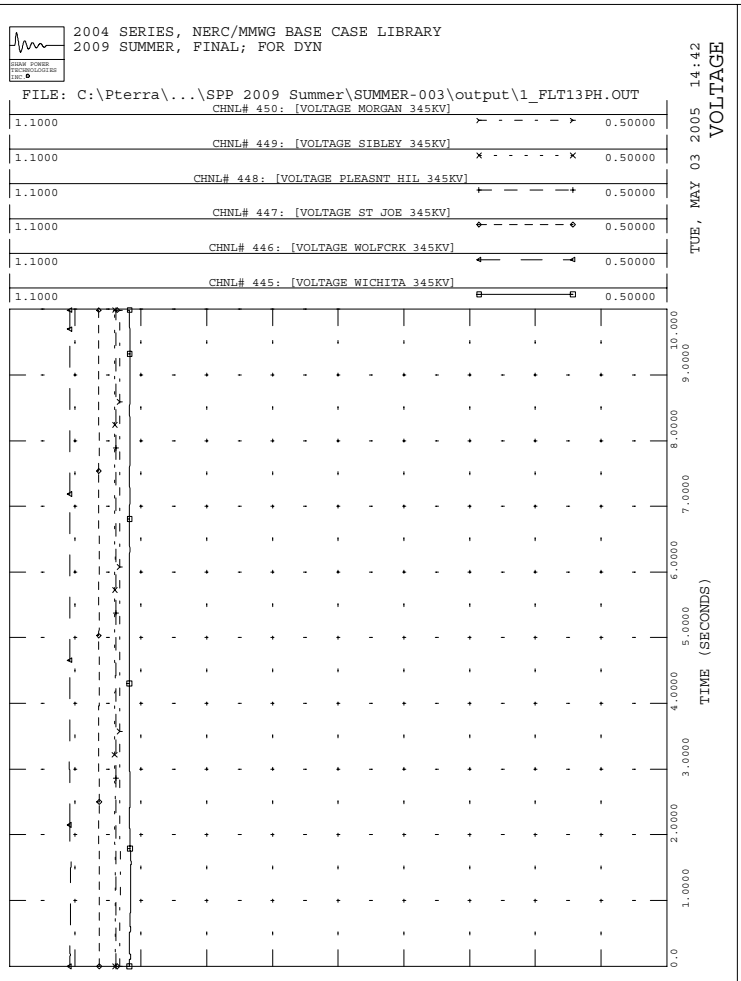
VOLTAGE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2009 SUMMER, FINAL; FOR DYN
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CHNL# 449: [VOLTAGE SIBLEY 345KV]
CHNL# 448: [VOLTAGE PLEASNT HIL 345KV]
CHNL# 447: [VOLTAGE ST JOE 345KV]
CHNL# 446: [VOLTAGE WOLFCRK 345KV]
CHNL# 445: [VOLTAGE WICHITA 345KV]
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TUE, MAY 03 2005 14:42
VOLTAGE
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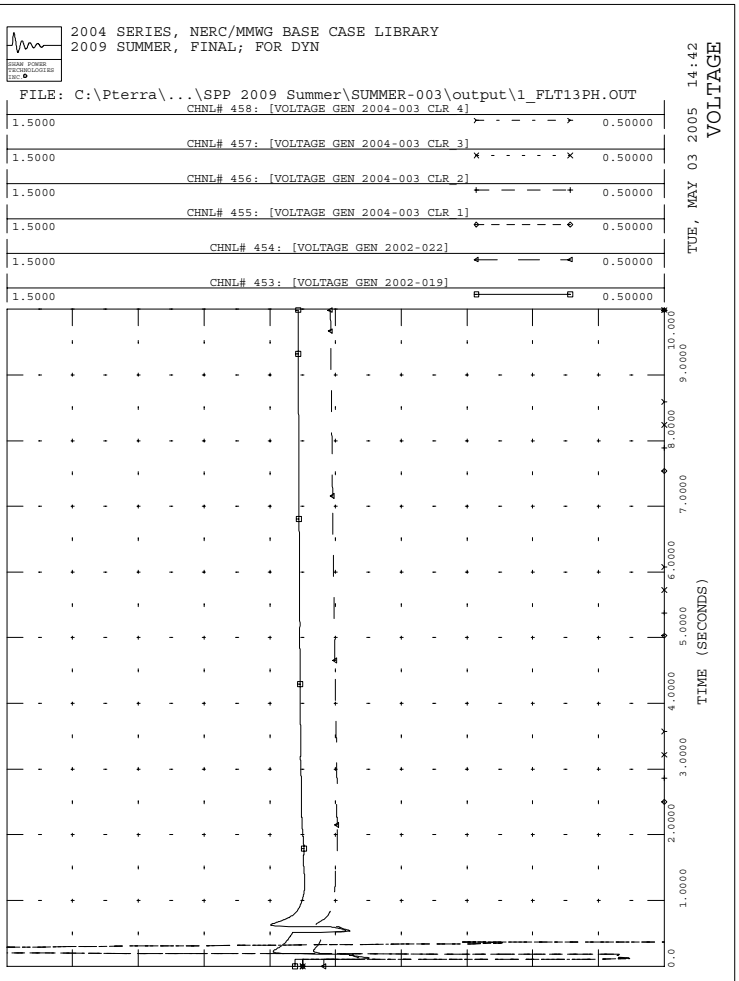
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 458: [VOLTAGE GEN 2004-003 CLR 4]
CHNL# 457: [VOLTAGE GEN 2004-003 CLR 3]
CHNL# 456: [VOLTAGE GEN 2004-003 CLR 2]
CHNL# 455: [VOLTAGE GEN 2004-003 CLR 1]
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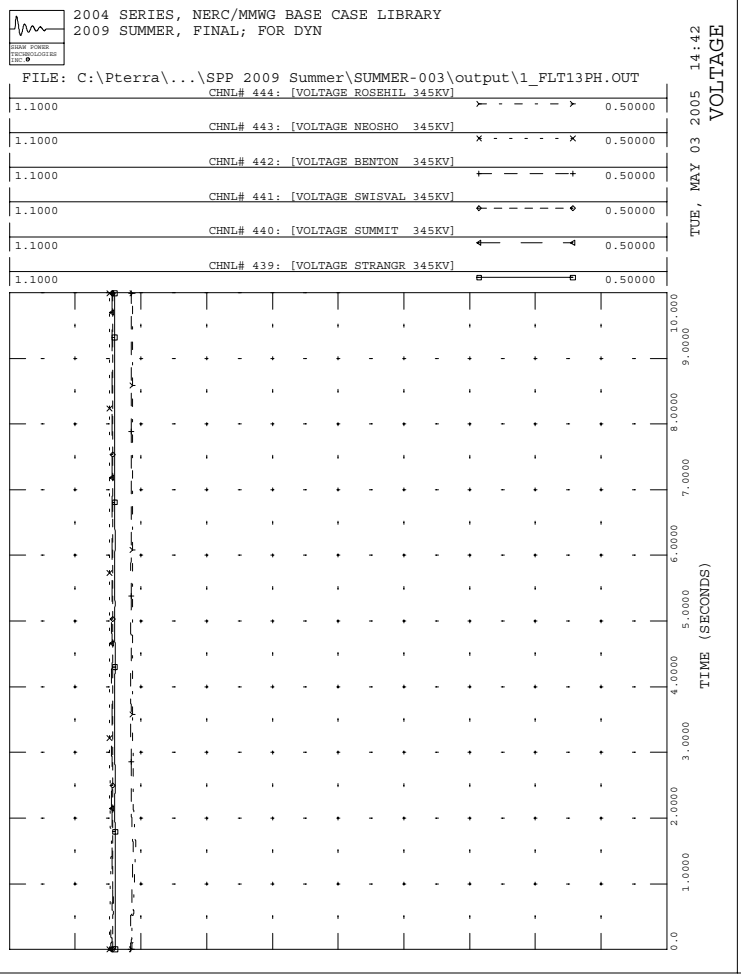
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 444: [VOLTAGE ROSEHIL 345KV]
CHNL# 443: [VOLTAGE NEOSHO 345KV]
CHNL# 442: [VOLTAGE BENTON 345KV]
CHNL# 441: [VOLTAGE SWISVAL 345KV]
CHNL# 440: [VOLTAGE SUMMIT 345KV]
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TUE, MAY 03 2005 14:42
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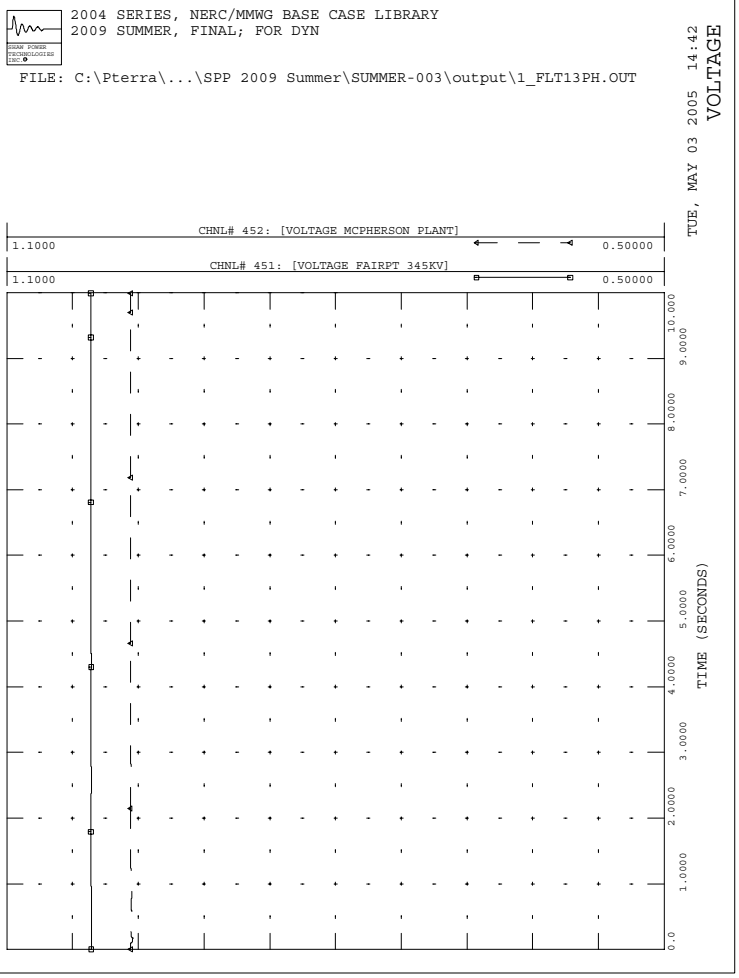
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 452: [VOLTAGE MCPHERSON PLANT]
CHNL# 451: [VOLTAGE FAIRPT 345KV]
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VOLTAGE
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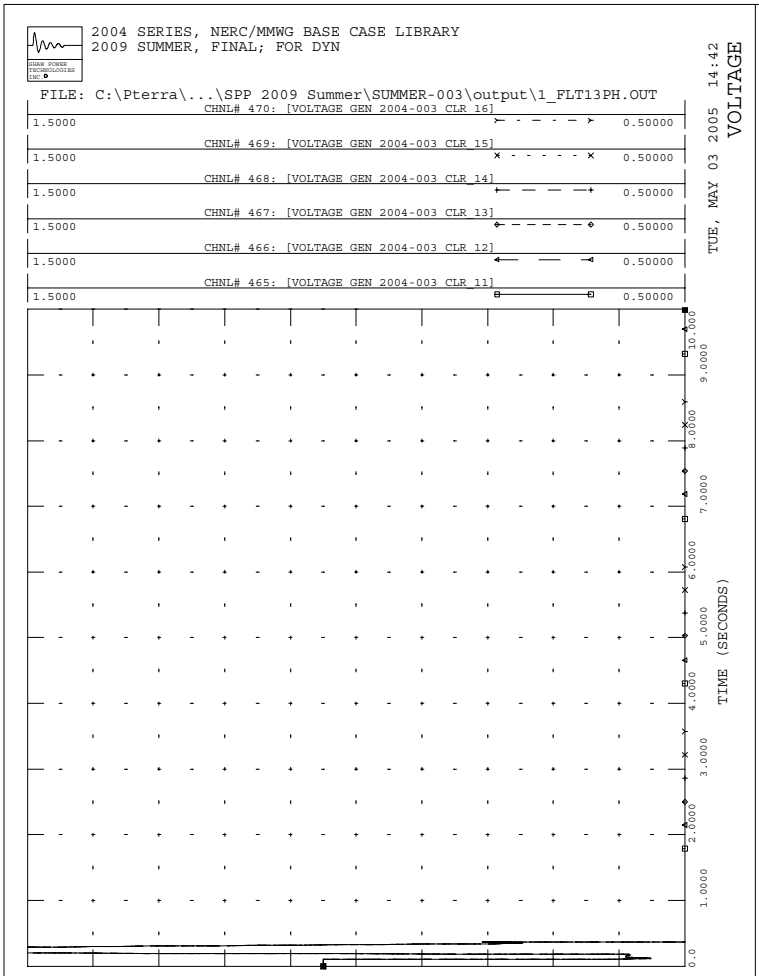
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2009 SUMMER, FINAL; FOR DYN
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CHNL# 469: [VOLTAGE GEN 2004-003 CLR 15]
CHNL# 468: [VOLTAGE GEN 2004-003 CLR_14]
CHNL# 467: [VOLTAGE GEN 2004-003 CLR 13]
CHNL# 466: [VOLTAGE GEN 2004-003 CLR 12]
CHNL# 465: [VOLTAGE GEN 2004-003 CLR_11]
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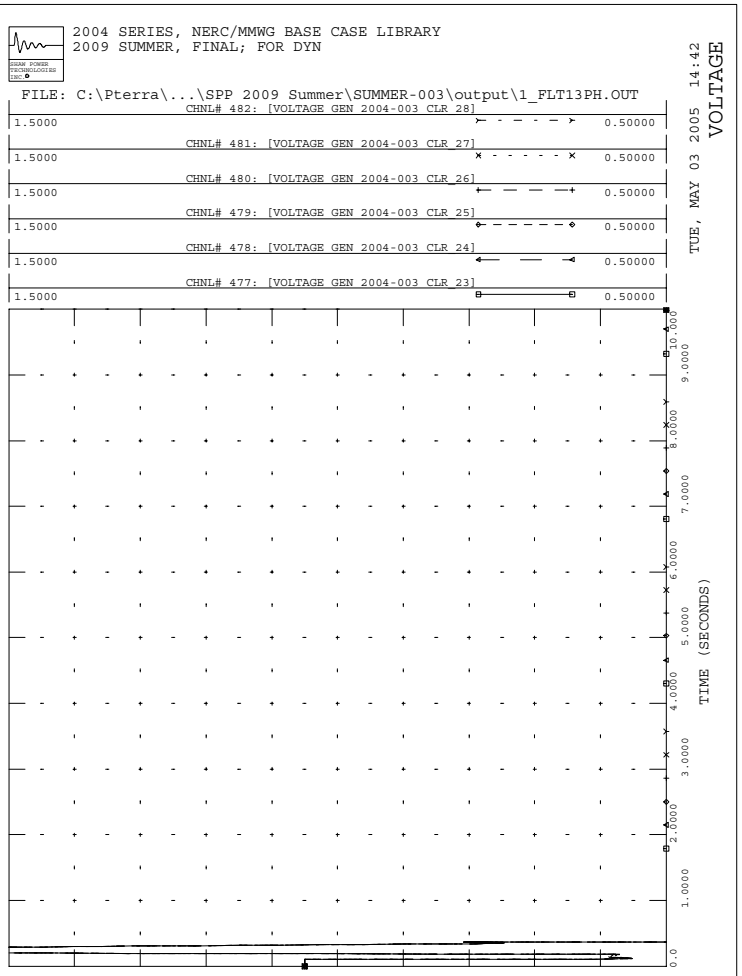
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\1_FLT13PH.OUT
CHNL# 482: [VOLTAGE GEN 2004-003 CLR 28]
CHNL# 481: [VOLTAGE GEN 2004-003 CLR_27]
CHNL# 480: [VOLTAGE GEN 2004-003 CLR_26]
CHNL# 479: [VOLTAGE GEN 2004-003 CLR 25]
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CHNL# 477: [VOLTAGE GEN 2004-003 CLR_23]
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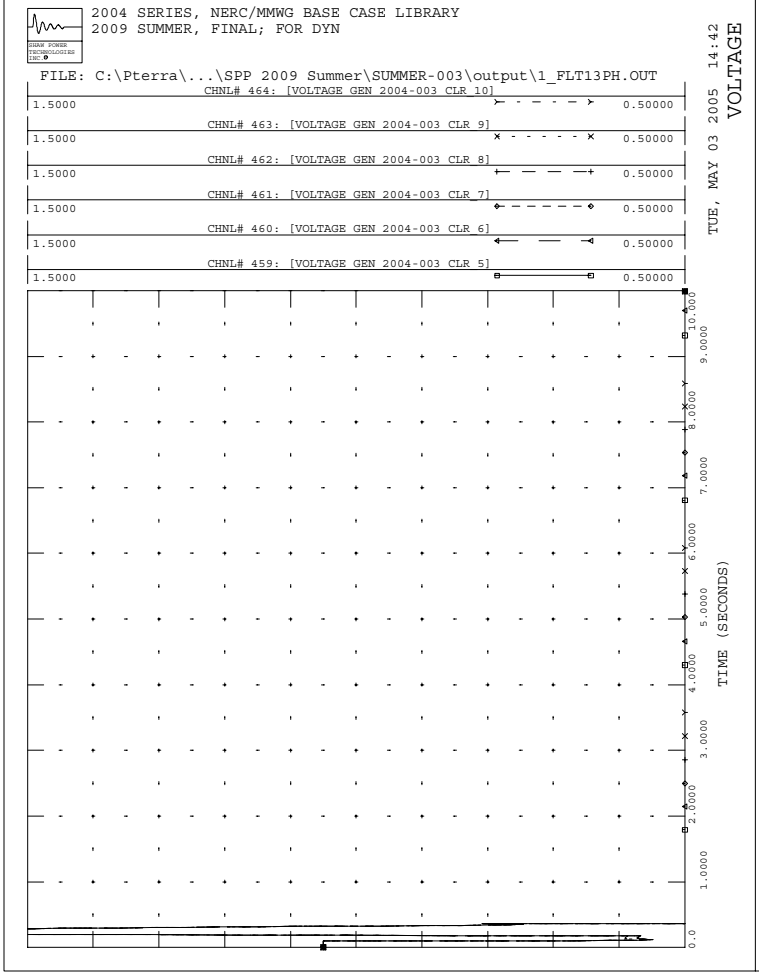
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 463: [VOLTAGE GEN 2004-003 CLR_9]
CHNL# 462: [VOLTAGE GEN 2004-003 CLR_8]
CHNL# 461: [VOLTAGE GEN 2004-003 CLR_7]
CHNL# 460: [VOLTAGE GEN 2004-003 CLR_6]
CHNL# 459: [VOLTAGE GEN 2004-003 CLR_5]
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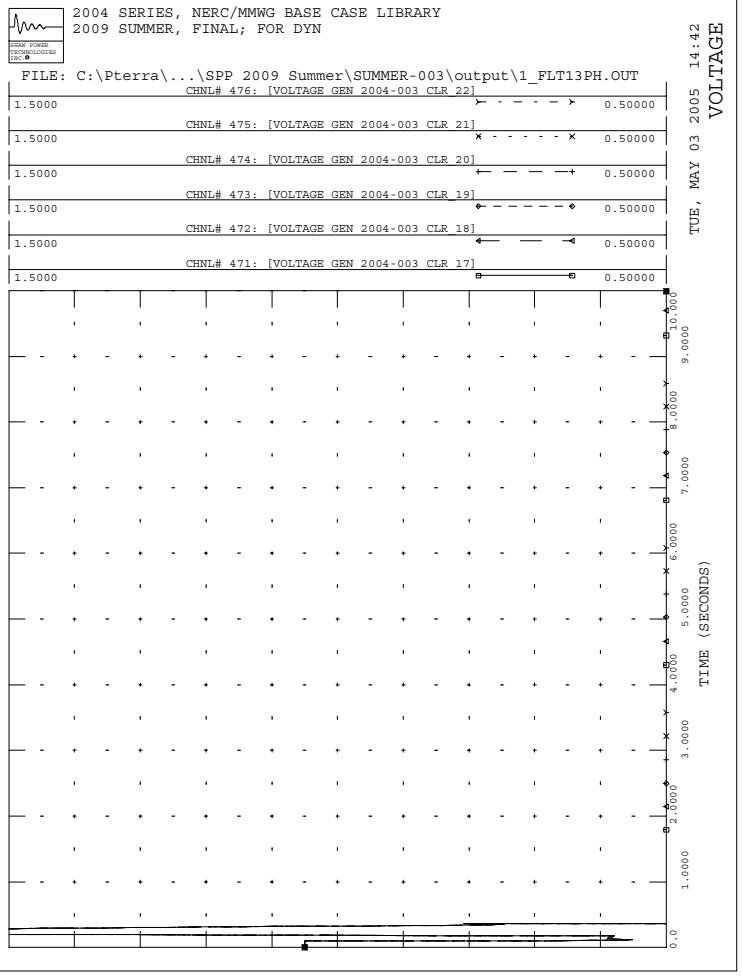
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2009 SUMMER, FINAL; FOR DYN
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CHNL# 474: [VOLTAGE GEN 2004-003 CLR_20]
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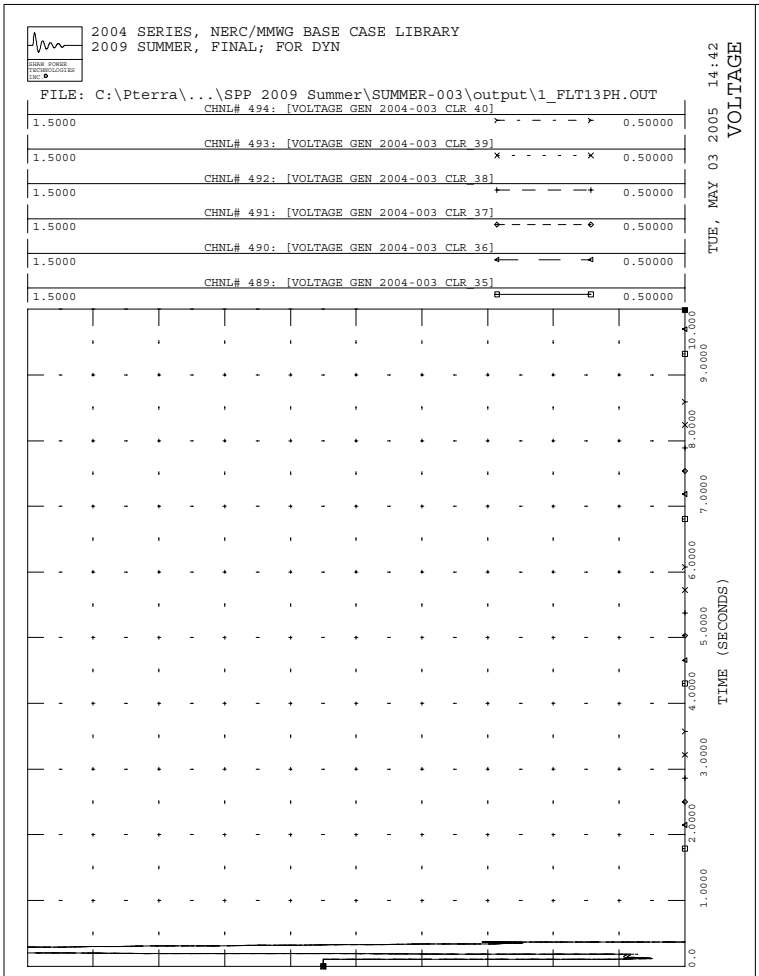
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 492: [VOLTAGE GEN 2004-003 CLR 38]
CHNL# 491: [VOLTAGE GEN 2004-003 CLR 37]
CHNL# 490: [VOLTAGE GEN 2004-003 CLR 36]
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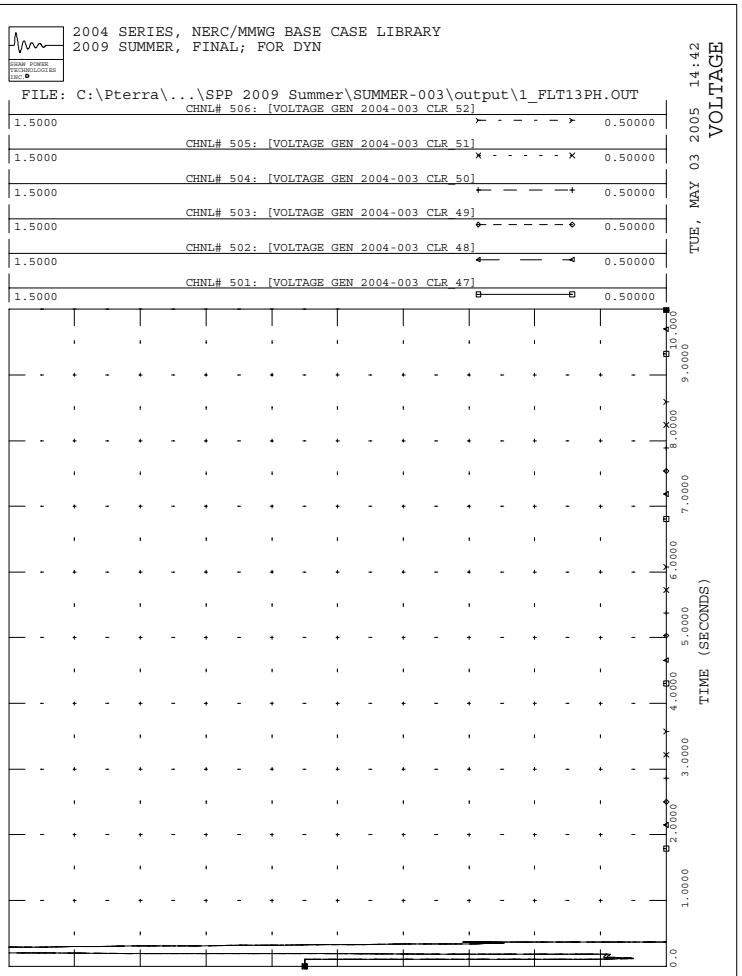
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 505: [VOLTAGE GEN 2004-003 CLR 51]
CHNL# 504: [VOLTAGE GEN 2004-003 CLR 50]
CHNL# 503: [VOLTAGE GEN 2004-003 CLR 49]
CHNL# 502: [VOLTAGE GEN 2004-003 CLR 48]
CHNL# 501: [VOLTAGE GEN 2004-003 CLR 47]
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TUE, MAY 03 2005 14:42
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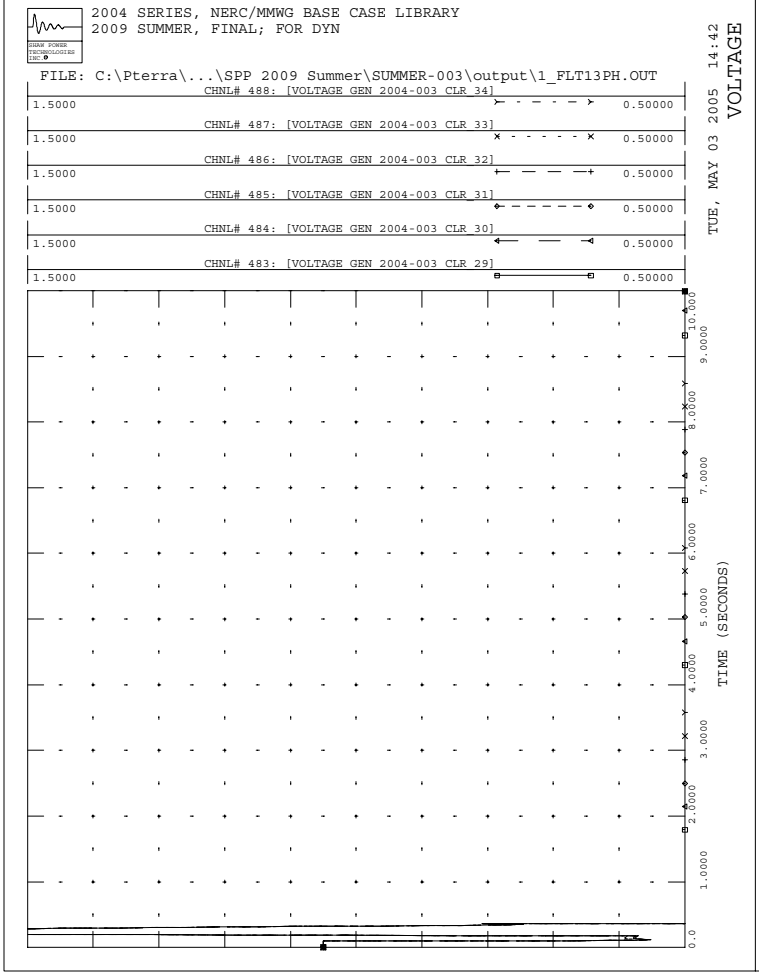
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 488: [VOLTAGE GEN 2004-003 CLR 34]
CHNL# 487: [VOLTAGE GEN 2004-003 CLR 33]
CHNL# 486: [VOLTAGE GEN 2004-003 CLR 32]
CHNL# 485: [VOLTAGE GEN 2004-003 CLR 31]
CHNL# 484: [VOLTAGE GEN 2004-003 CLR 30]
CHNL# 483: [VOLTAGE GEN 2004-003 CLR 29]
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TUE, MAY 03 2005 14:42
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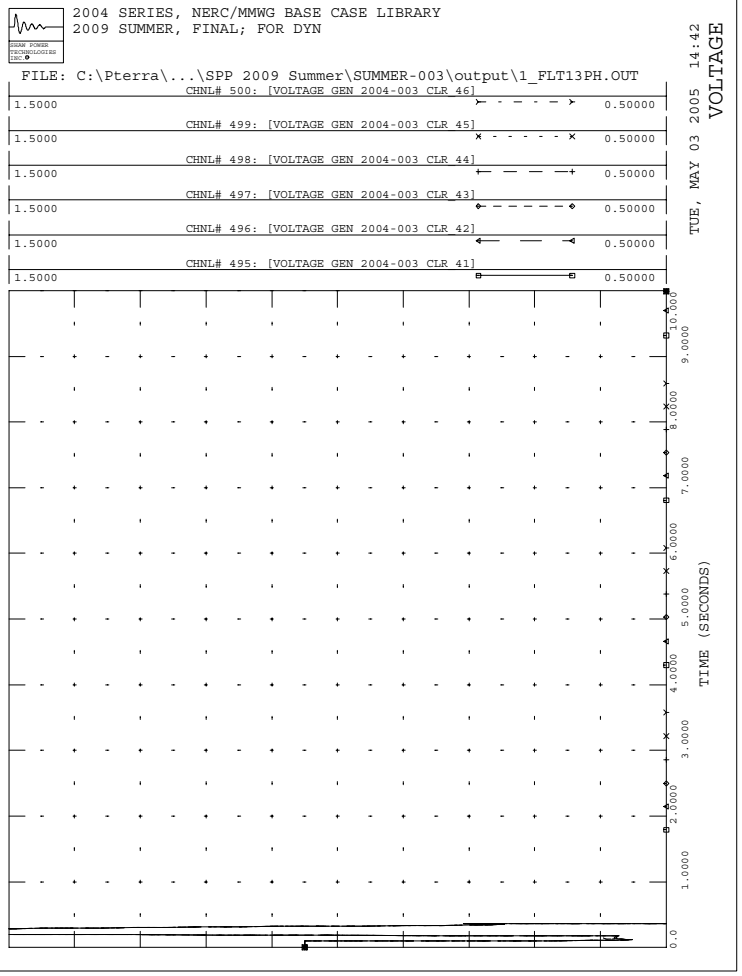
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
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CHNL# 499: [VOLTAGE GEN 2004-003 CLR 45]
CHNL# 498: [VOLTAGE GEN 2004-003 CLR 44]
CHNL# 497: [VOLTAGE GEN 2004-003 CLR 43]
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2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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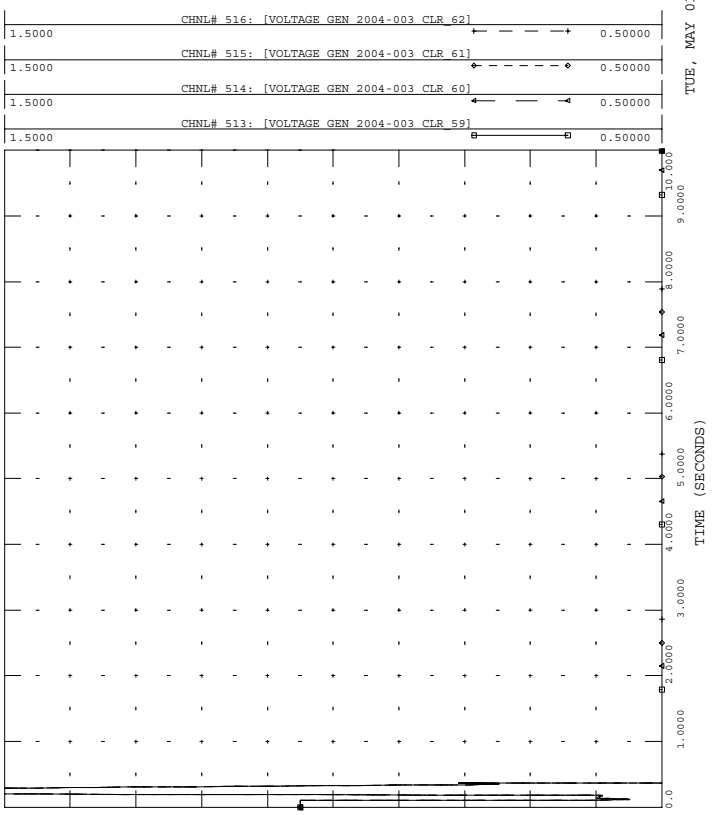
VOLTAGE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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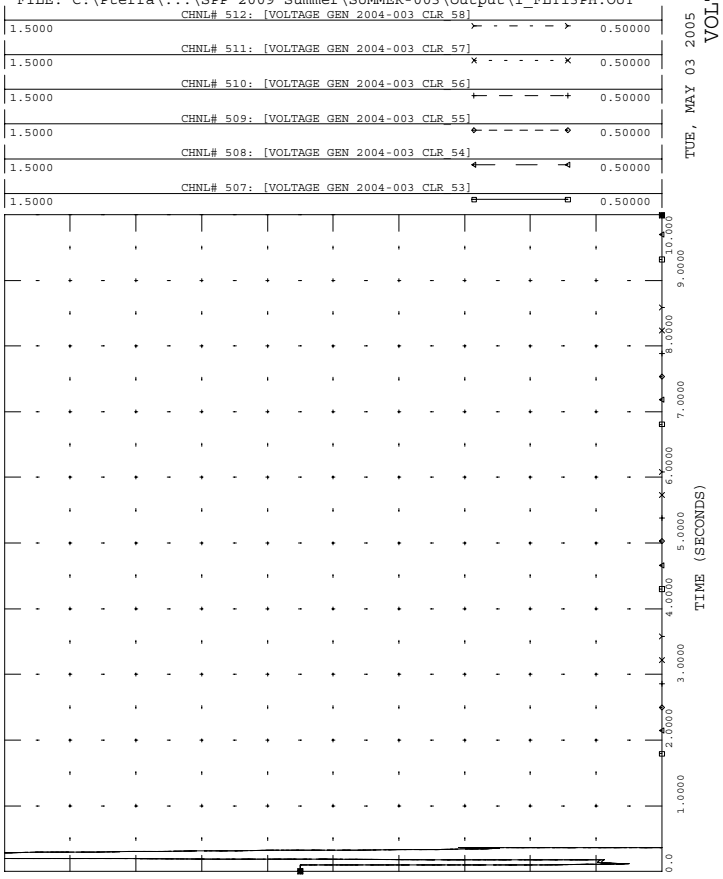

2. Disturbance #11 (Fault on the Grapevine to Elk City 230 kV line, near Elk City)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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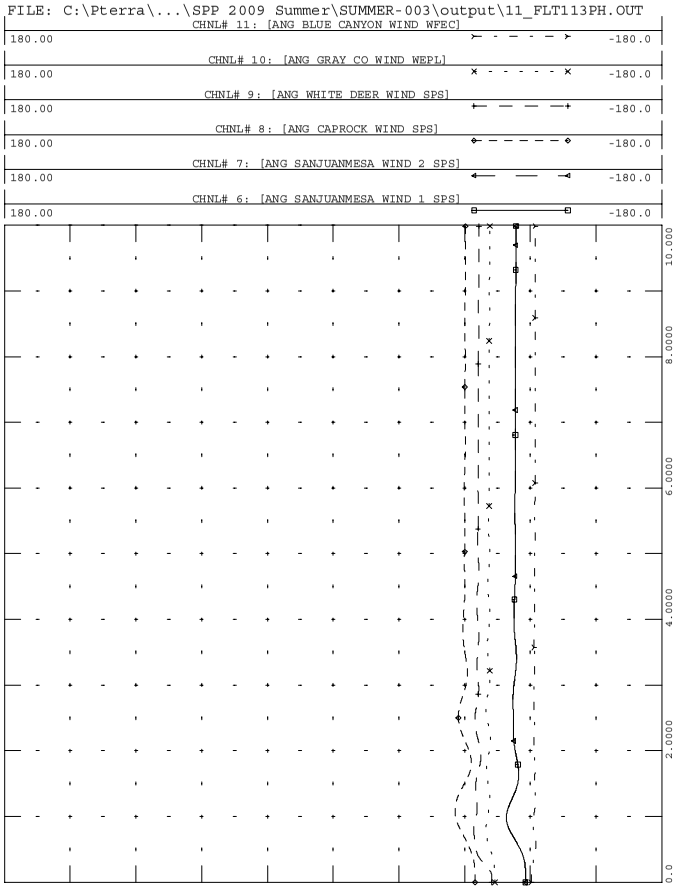

WED, MAY 04 2005 14:53
ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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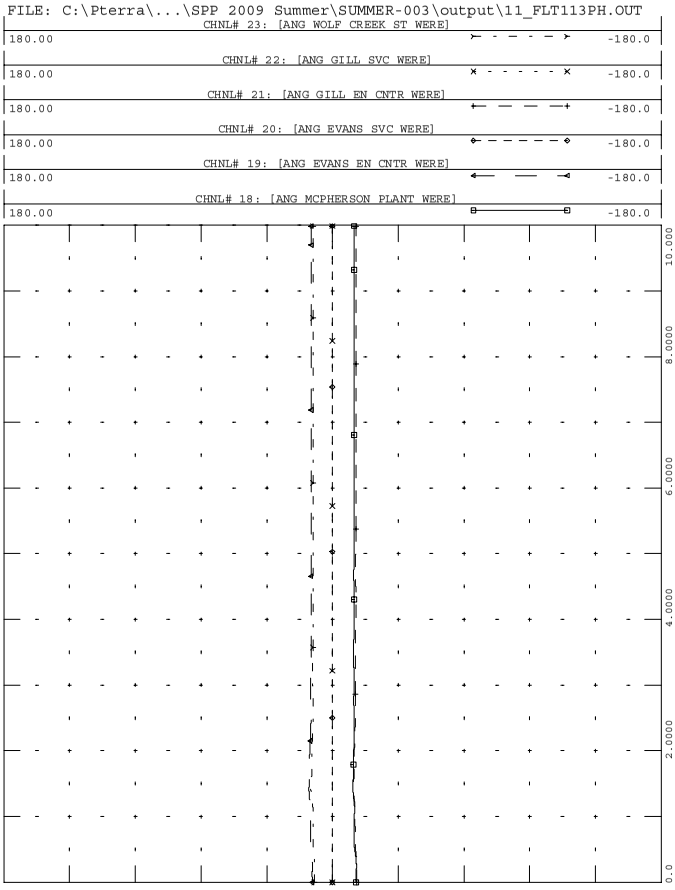

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ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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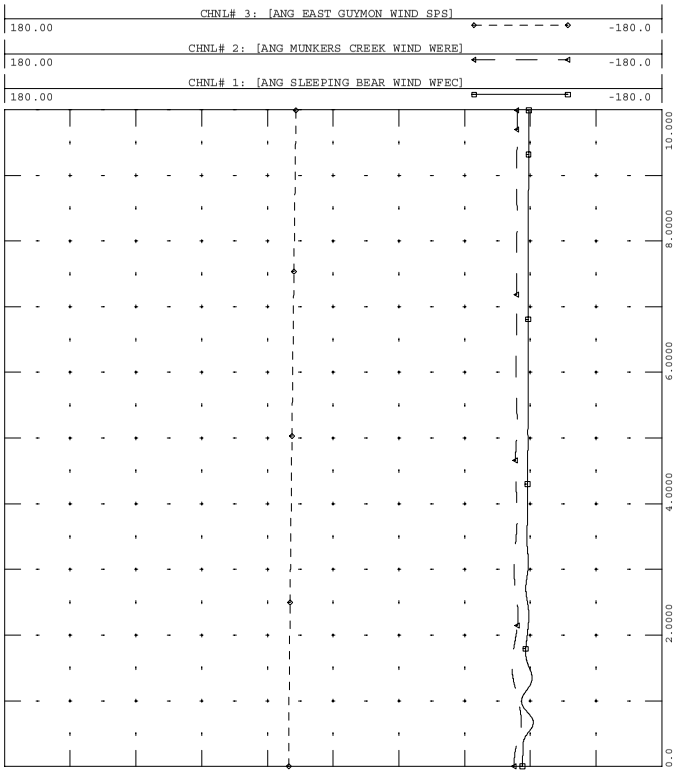

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2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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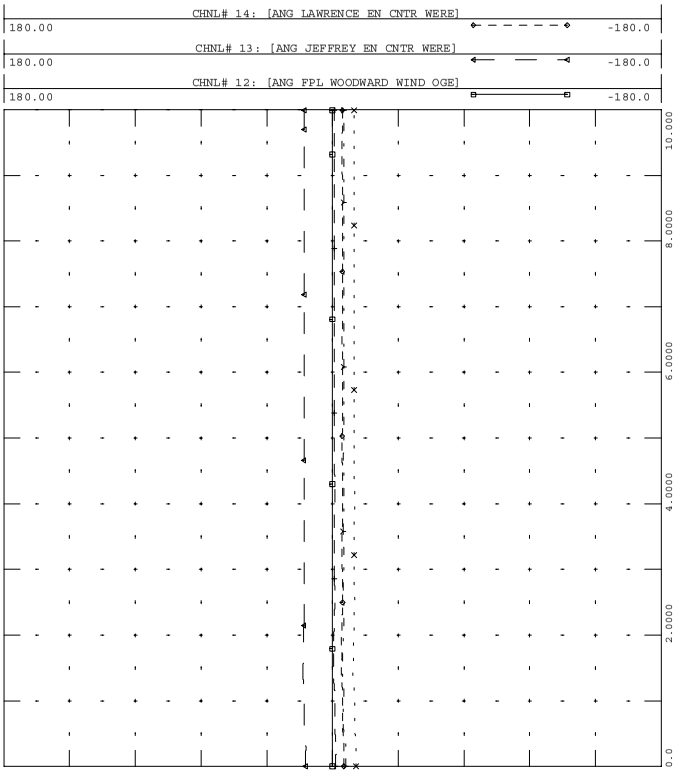

WED, MAY 04 2005 14:53
ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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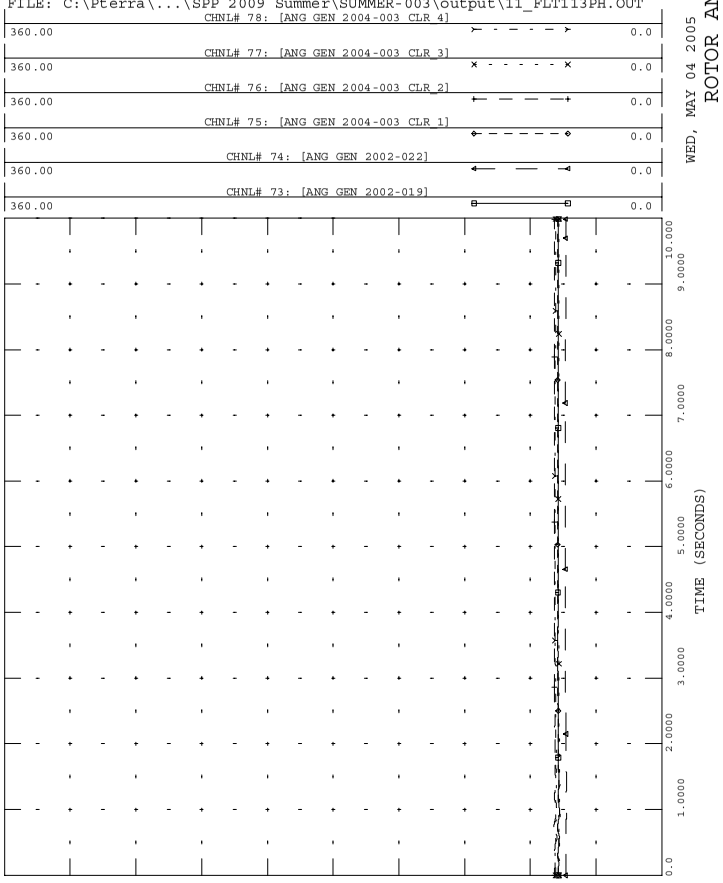

WED, MAY 04 2005 14:53
ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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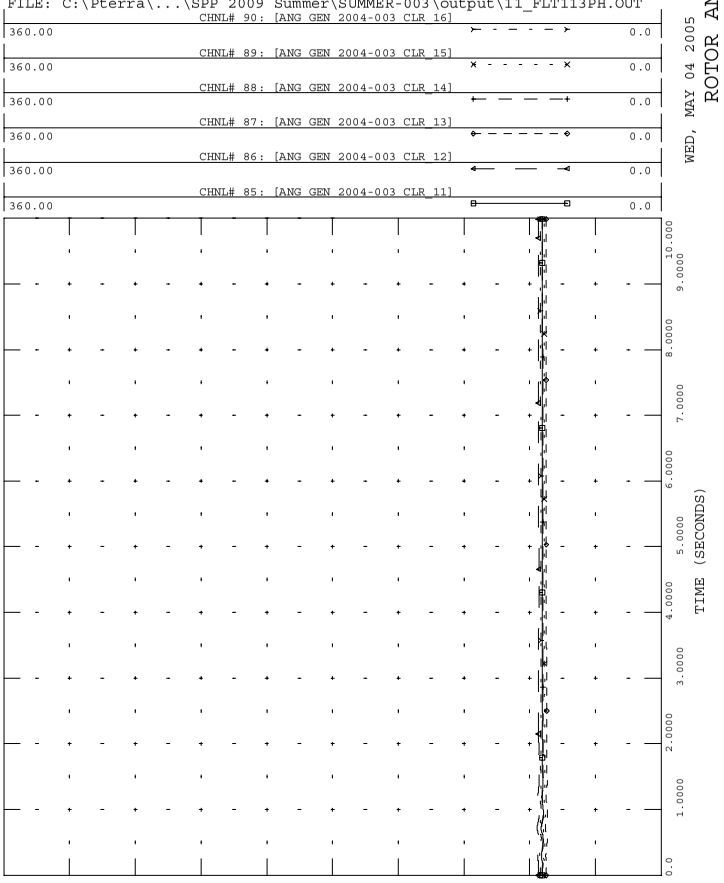

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ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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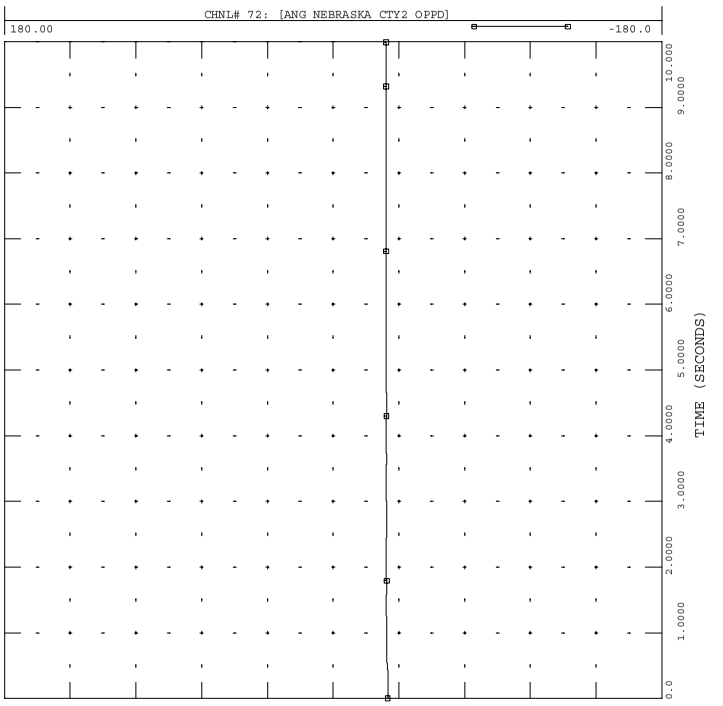

WED, MAY 04 2005 14:53
ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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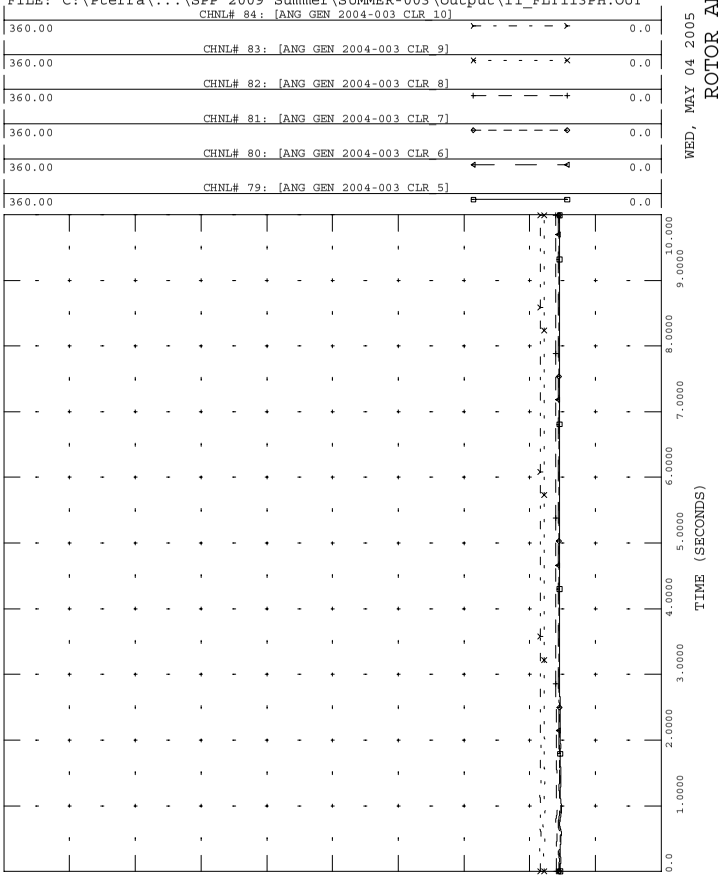

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ROTOR ANGLE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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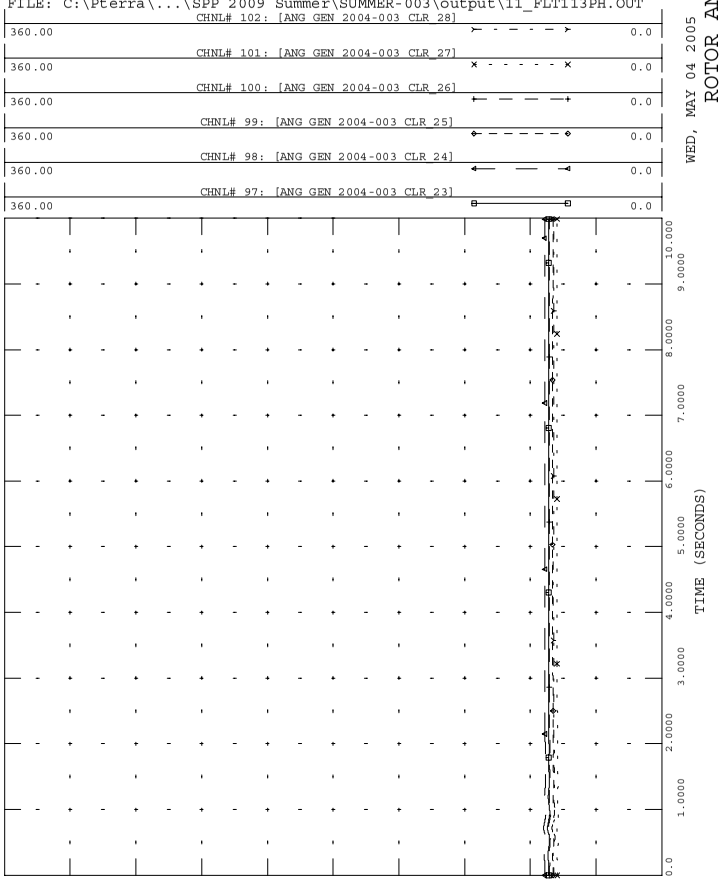
ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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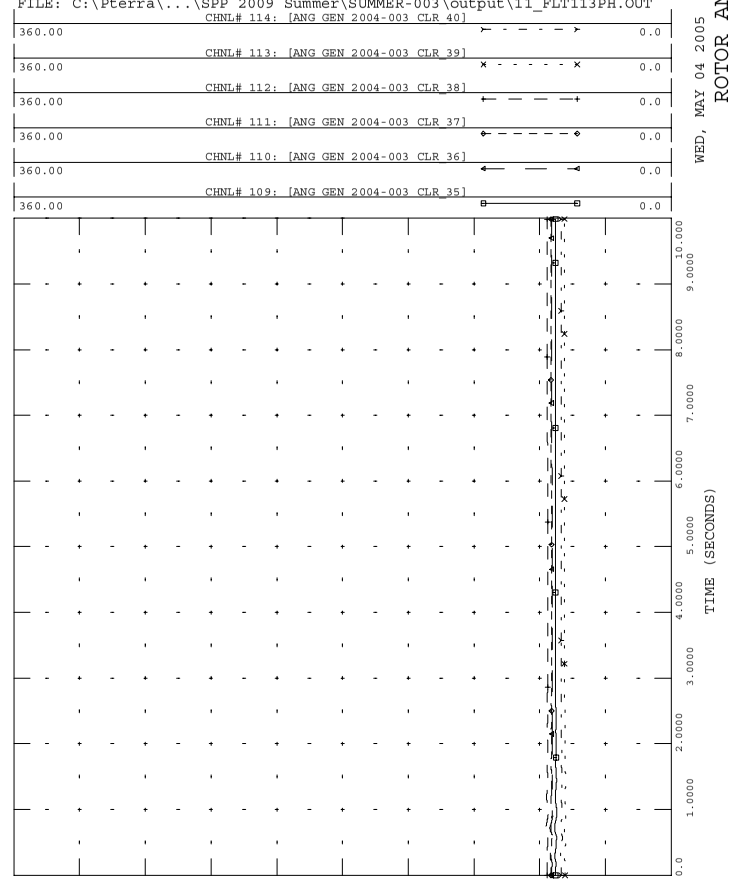
ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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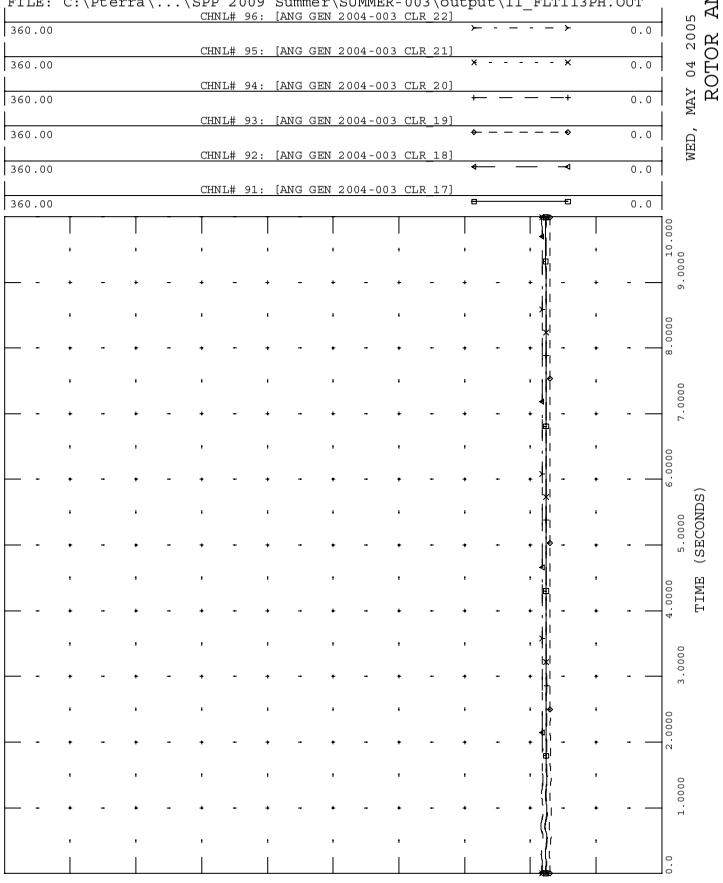

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
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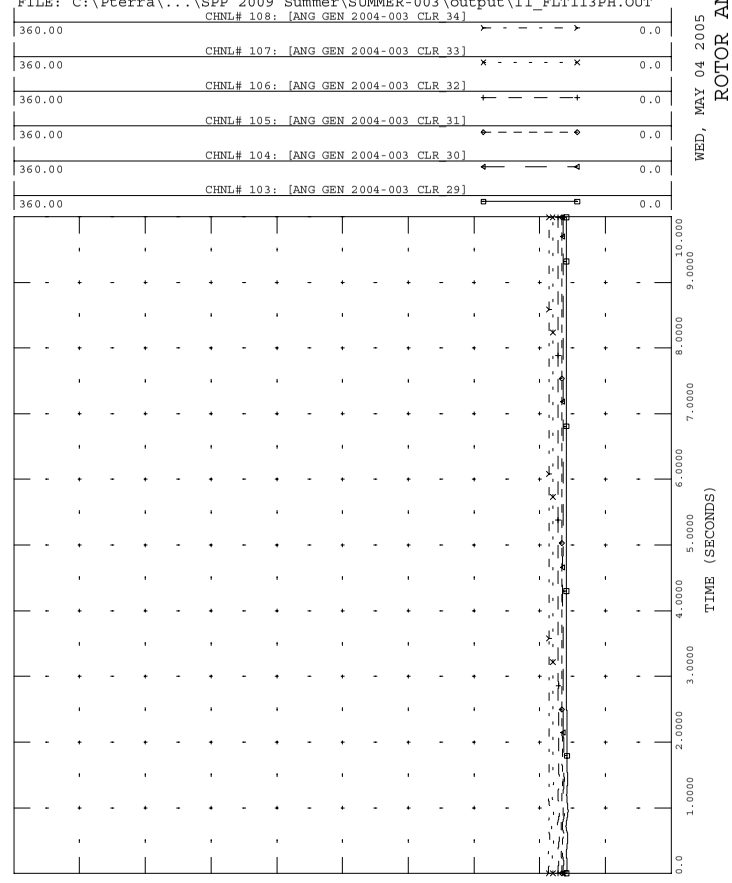
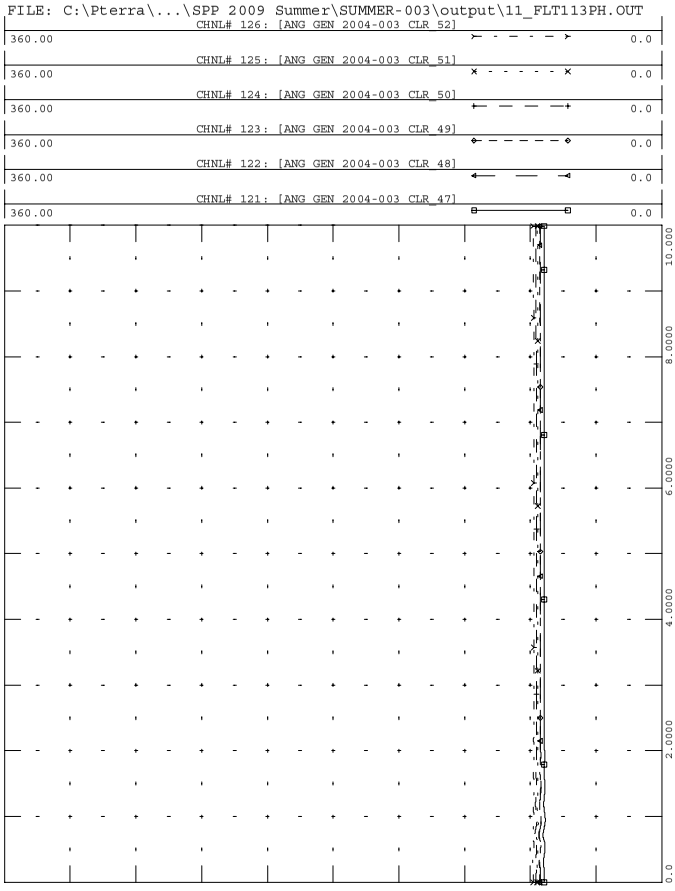
ROTOR ANGLE



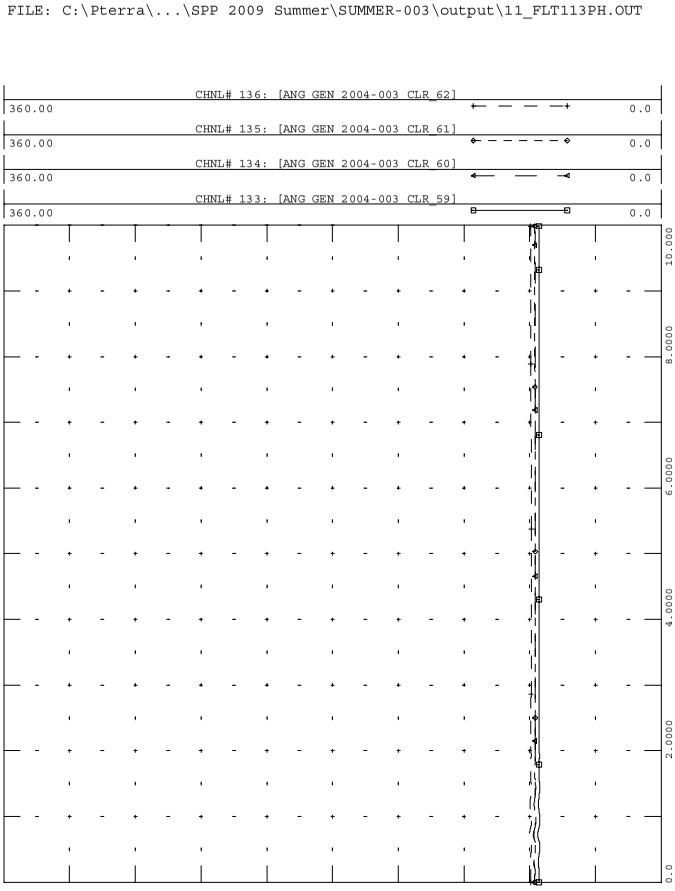
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



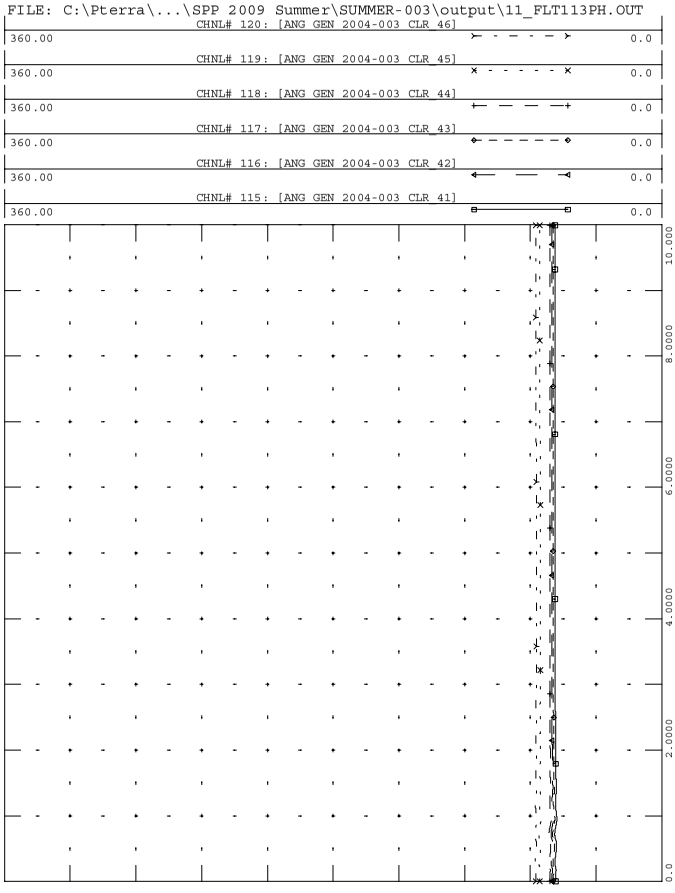
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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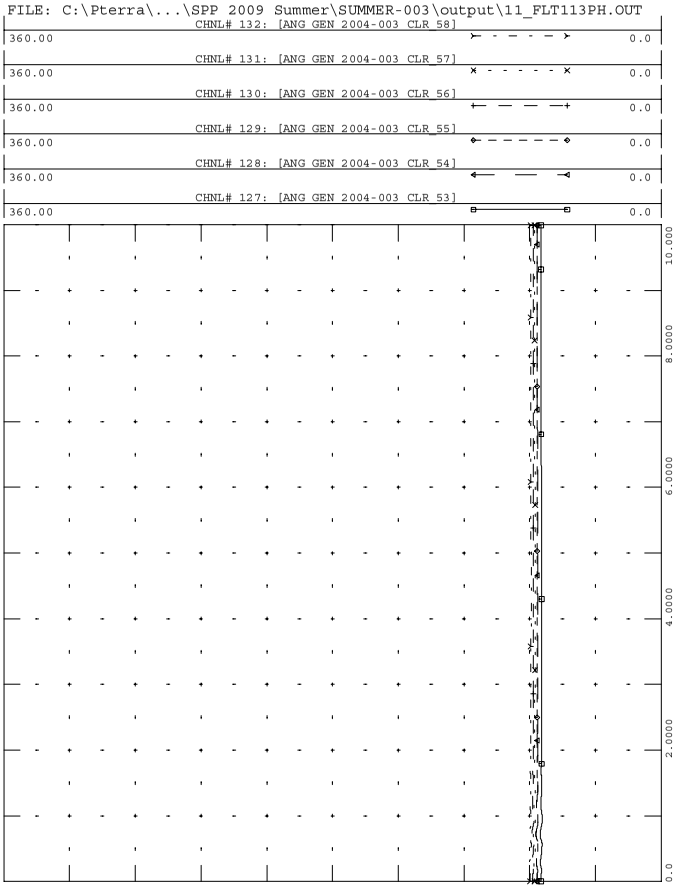
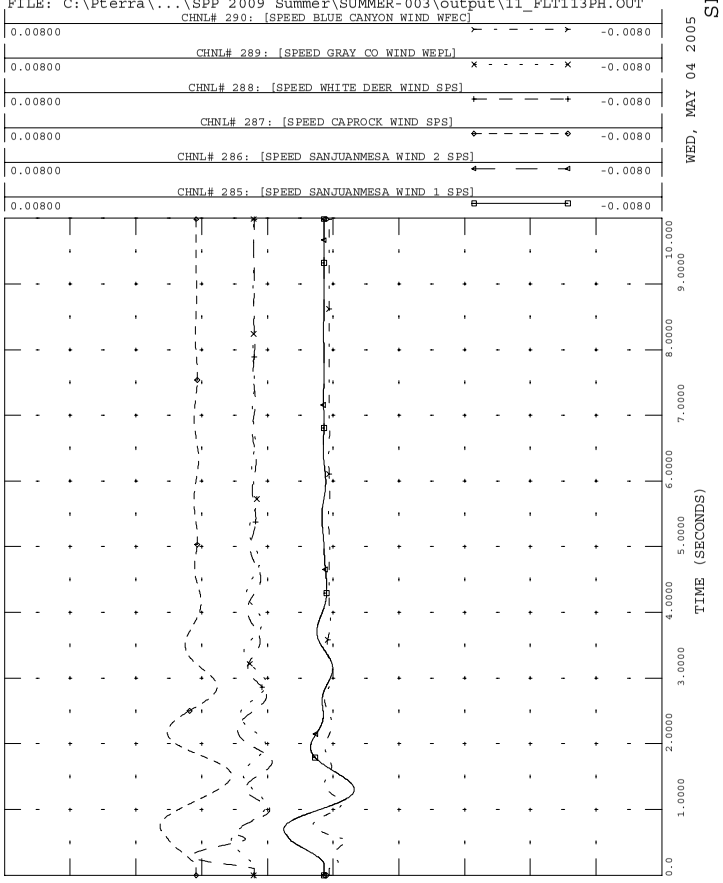


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

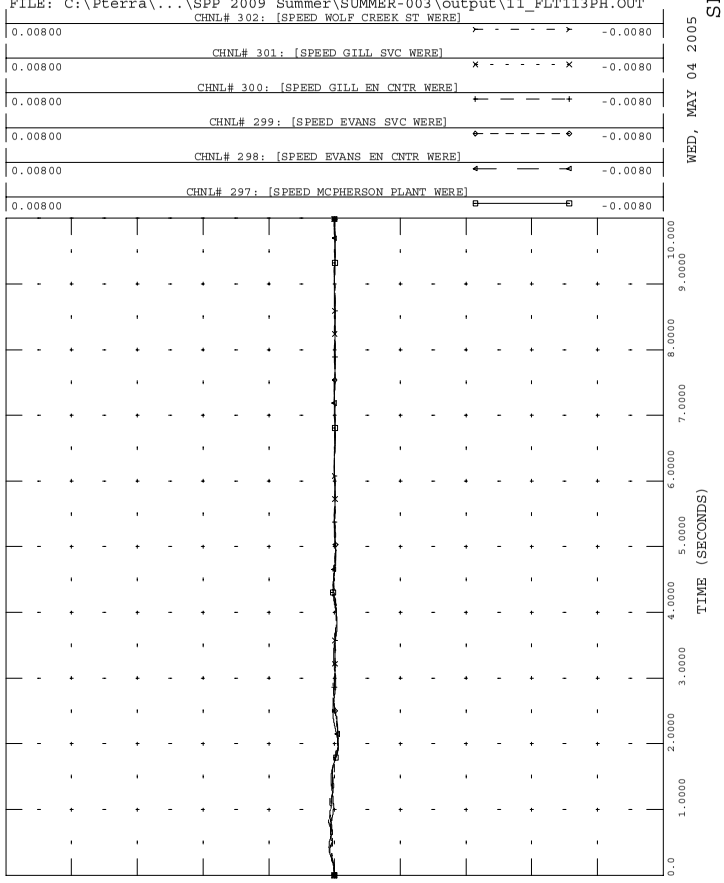
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:53 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

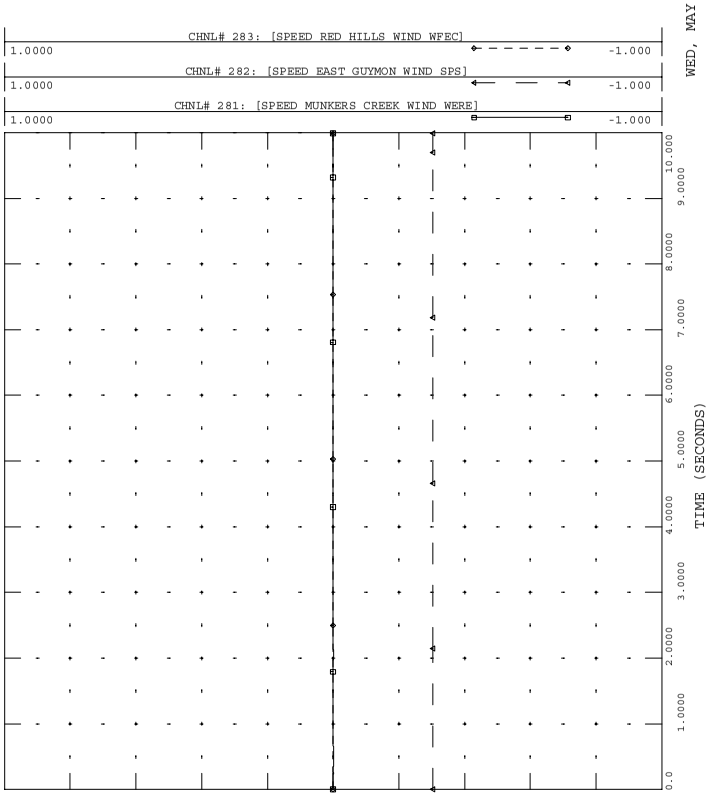
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:53 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:53 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

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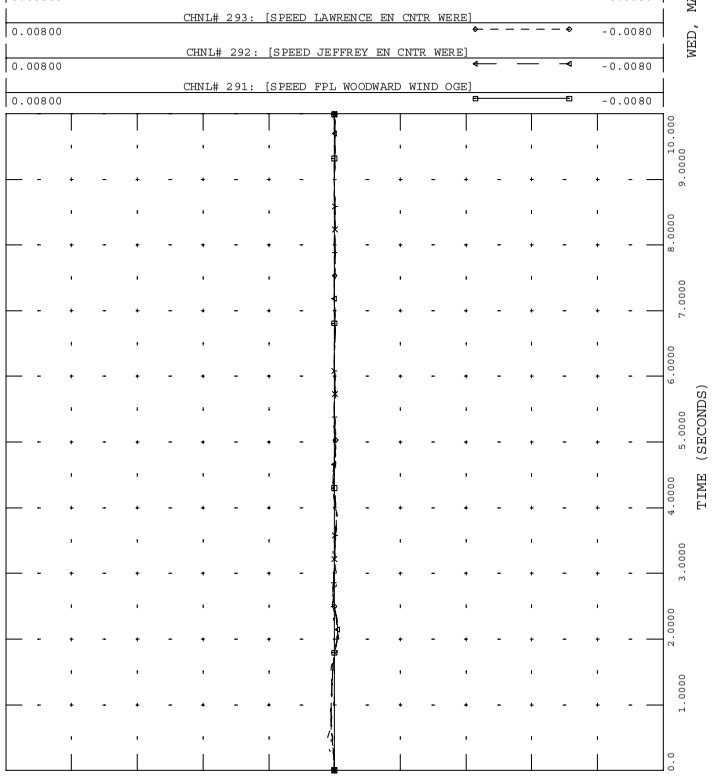
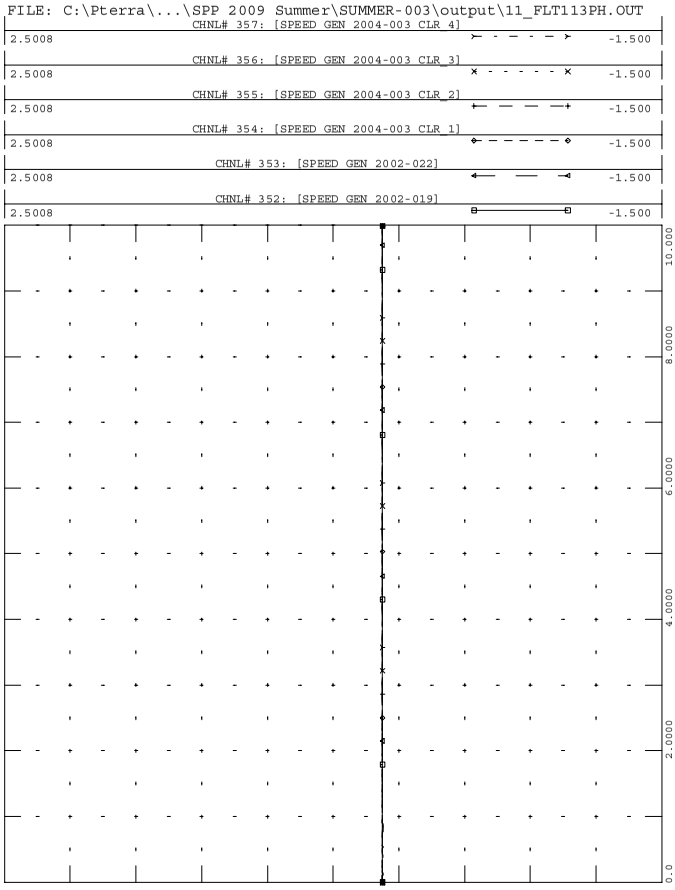


WED, MAY 04 2005 14:53 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

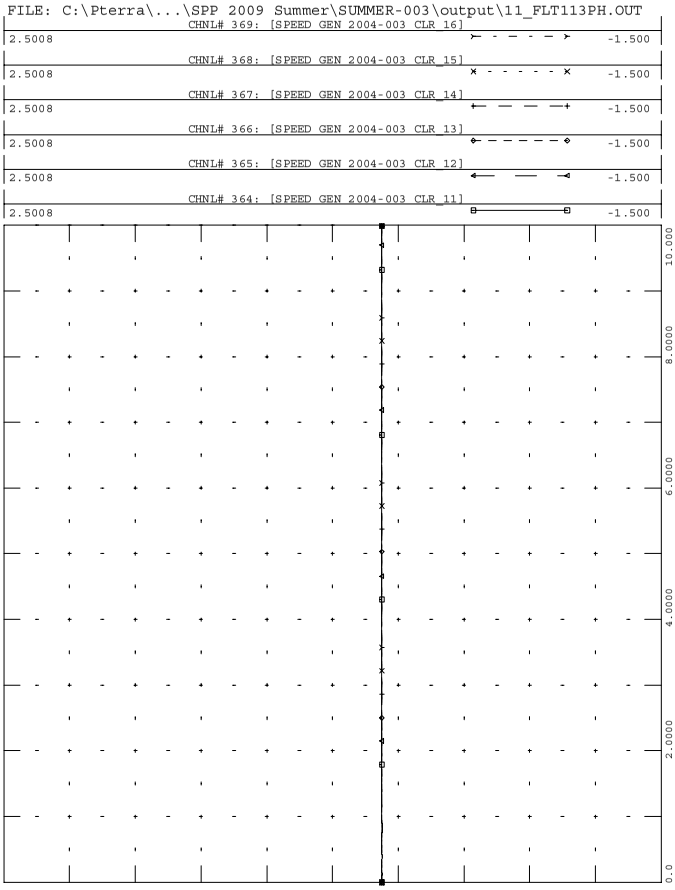
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

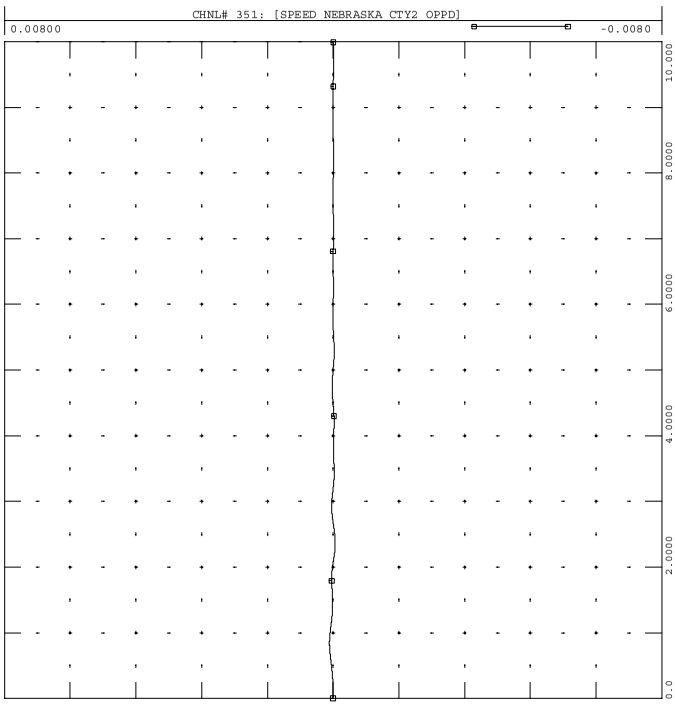
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

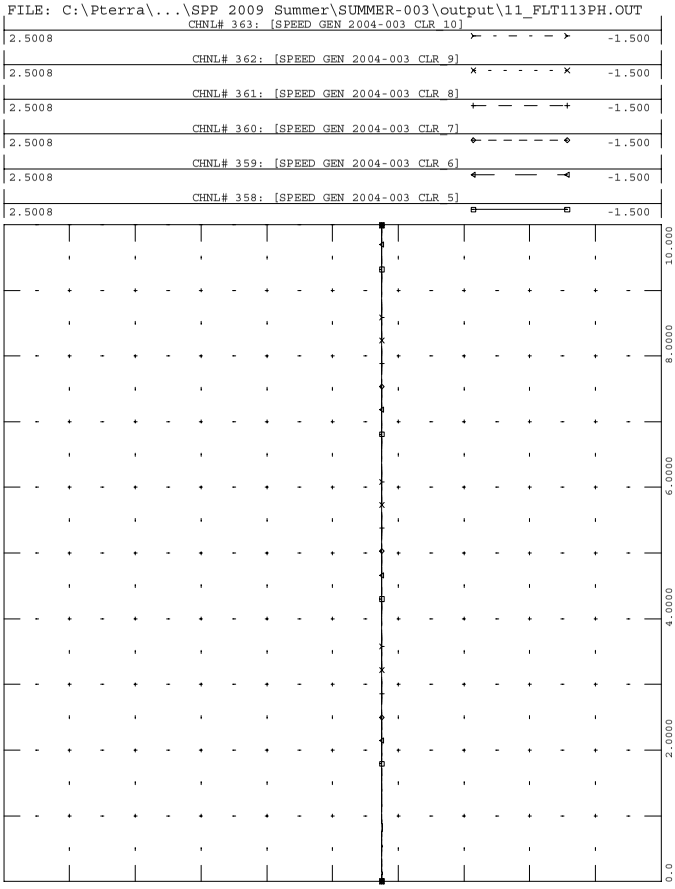
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

SHAW POWER TECHNOLOGIES INC.

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

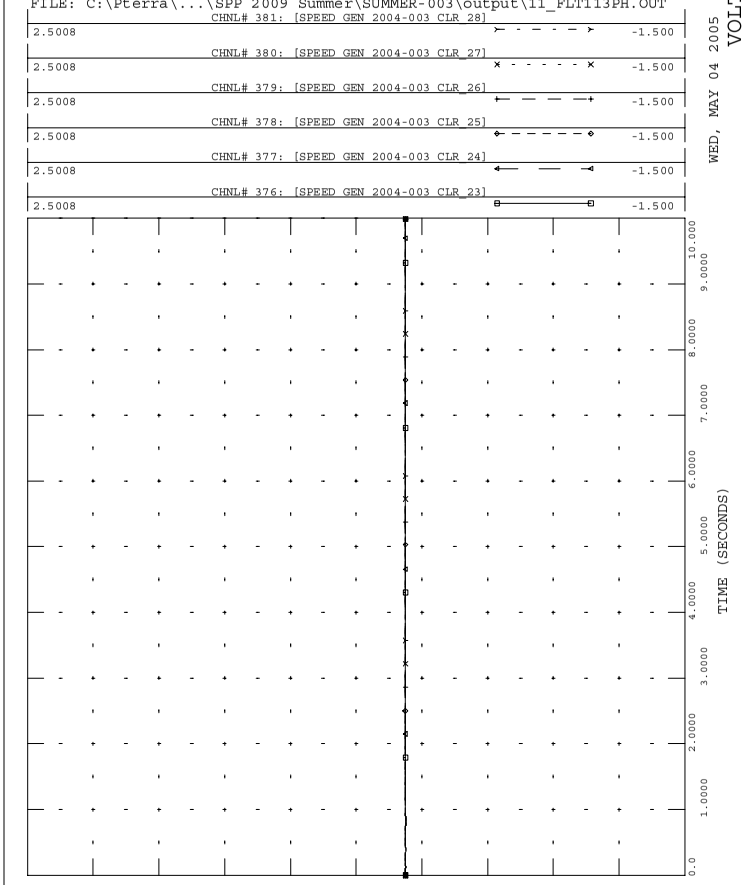
VOLTAGE

CHNL# 381: [SPEED GEN 2004-003 CLR 28]
CHNL# 380: [SPEED GEN 2004-003 CLR_27]
CHNL# 379: [SPEED GEN 2004-003 CLR_26]
CHNL# 378: [SPEED GEN 2004-003 CLR_25]
CHNL# 377: [SPEED GEN 2004-003 CLR_24]
CHNL# 376: [SPEED GEN 2004-003 CLR_23]

2.5008 -1.500

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

SHAW POWER TECHNOLOGIES INC.

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

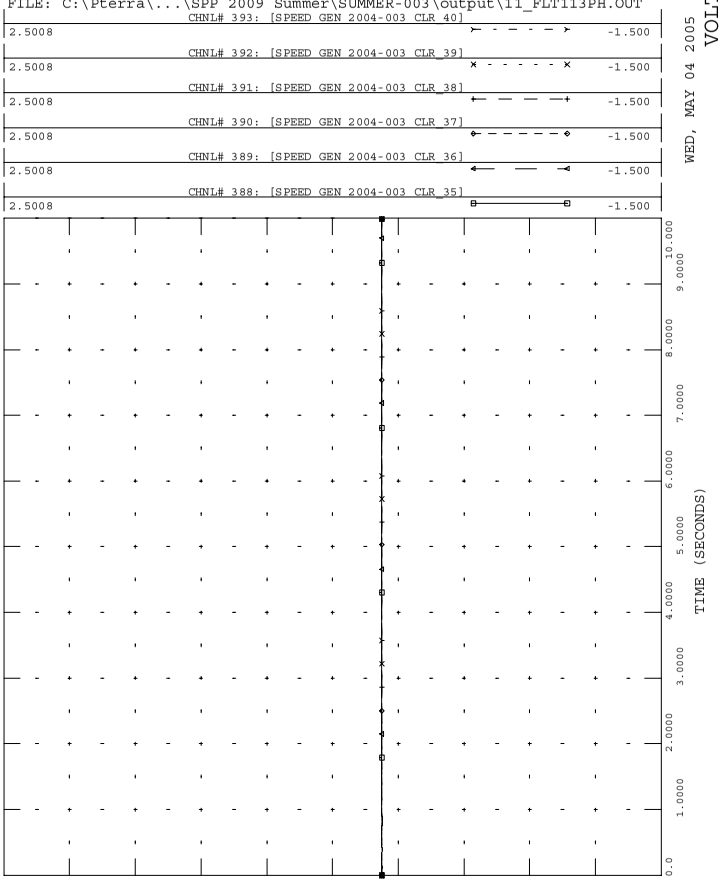
VOLTAGE

CHNL# 393: [SPEED GEN 2004-003 CLR 40]
CHNL# 392: [SPEED GEN 2004-003 CLR_39]
CHNL# 391: [SPEED GEN 2004-003 CLR_38]
CHNL# 390: [SPEED GEN 2004-003 CLR_37]
CHNL# 389: [SPEED GEN 2004-003 CLR_36]
CHNL# 388: [SPEED GEN 2004-003 CLR_35]

2.5008 -1.500

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

SHAW POWER TECHNOLOGIES INC.

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

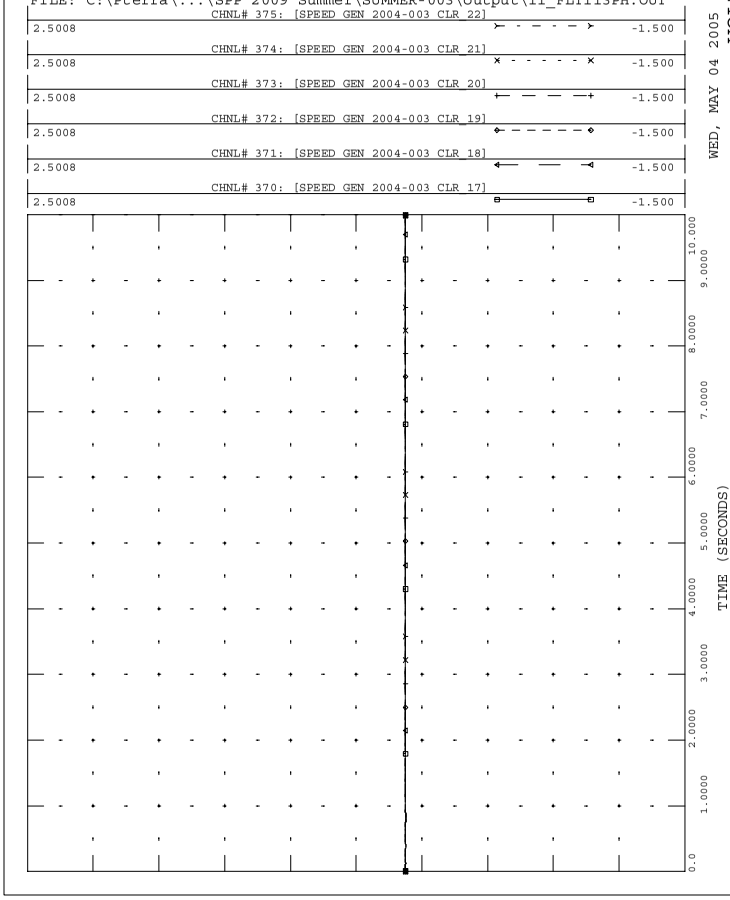
VOLTAGE

CHNL# 375: [SPEED GEN 2004-003 CLR 22]
CHNL# 374: [SPEED GEN 2004-003 CLR_21]
CHNL# 373: [SPEED GEN 2004-003 CLR_20]
CHNL# 372: [SPEED GEN 2004-003 CLR_19]
CHNL# 371: [SPEED GEN 2004-003 CLR_18]
CHNL# 370: [SPEED GEN 2004-003 CLR_17]

2.5008 -1.500

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

SHAW POWER TECHNOLOGIES INC.

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

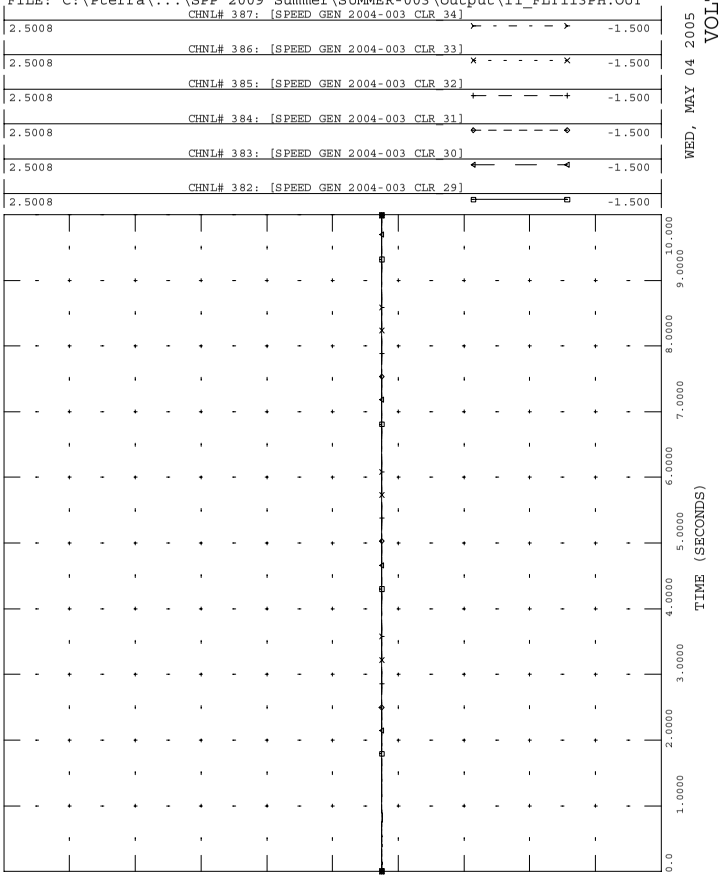
VOLTAGE

CHNL# 387: [SPEED GEN 2004-003 CLR 34]
CHNL# 386: [SPEED GEN 2004-003 CLR_33]
CHNL# 385: [SPEED GEN 2004-003 CLR_32]
CHNL# 384: [SPEED GEN 2004-003 CLR_31]
CHNL# 383: [SPEED GEN 2004-003 CLR_30]
CHNL# 382: [SPEED GEN 2004-003 CLR_29]

2.5008 -1.500

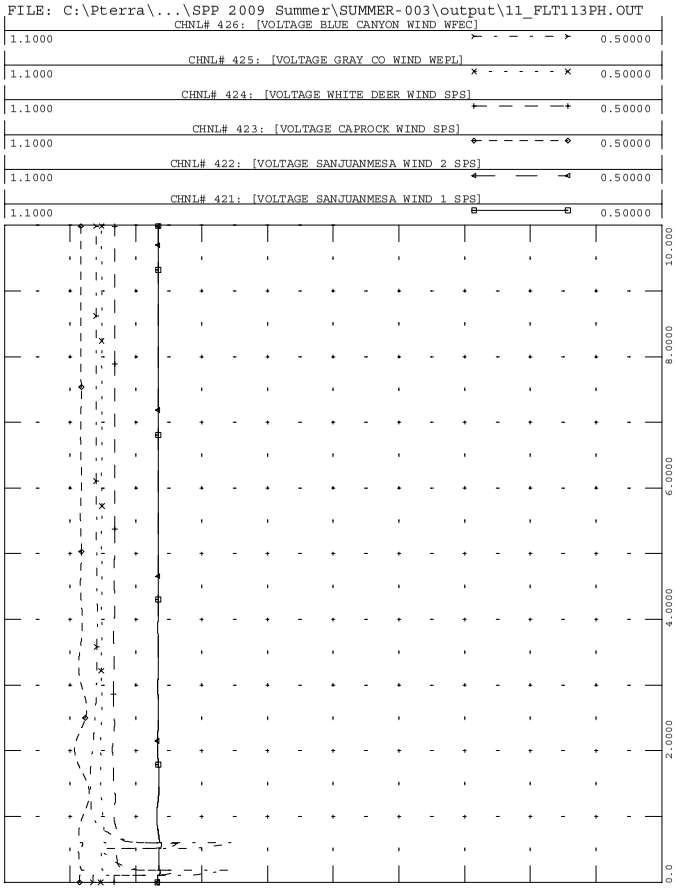
0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

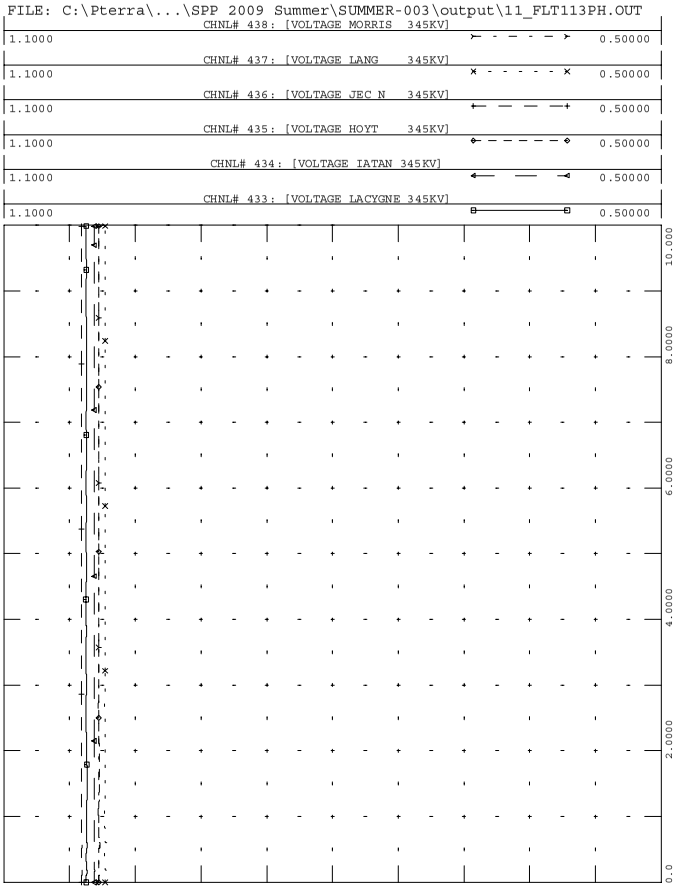
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

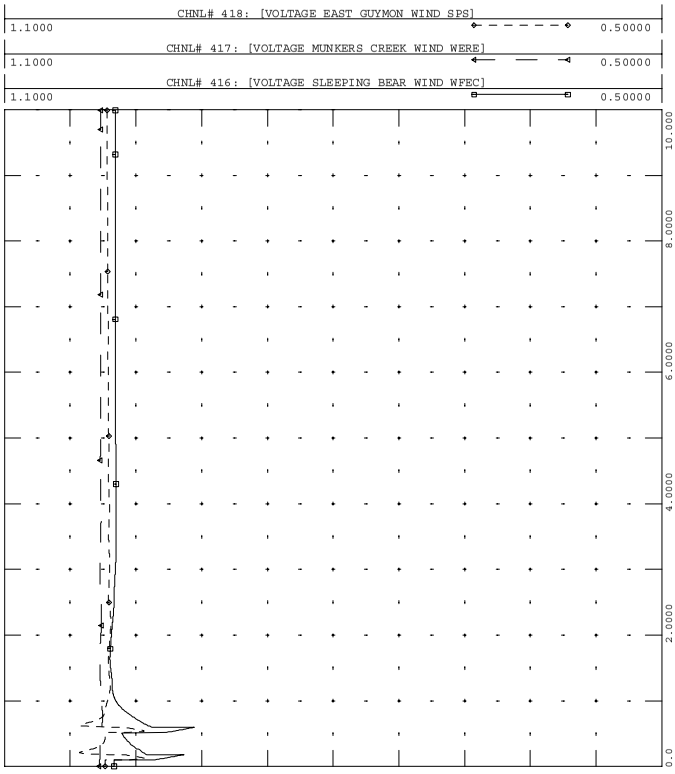
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

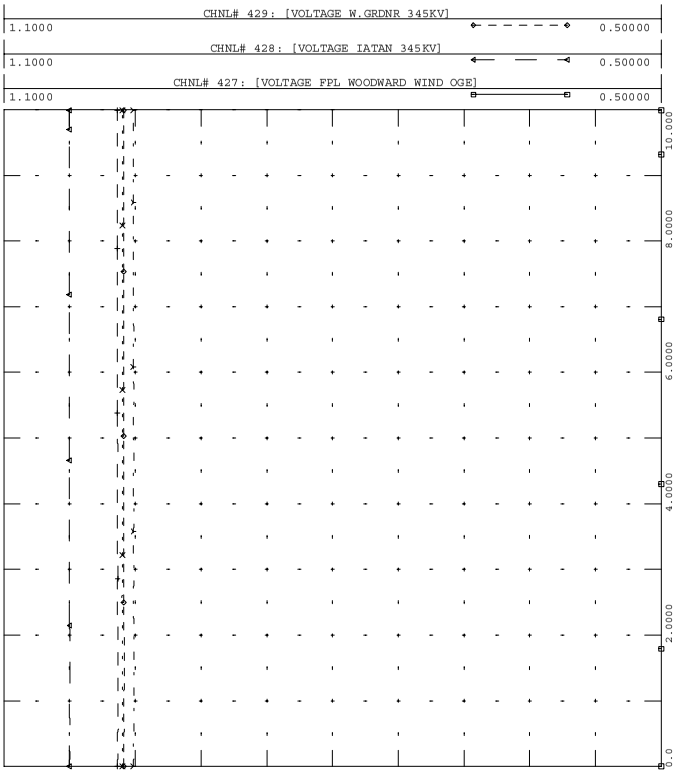
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT



WED, MAY 04 2005 14:54 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54 VOLTAGE

CHNL# 450: [VOLTAGE MORGAN 345KV]
CHNL# 449: [VOLTAGE SIBLEY 345KV]
CHNL# 448: [VOLTAGE PLEASNT HIL 345KV]
CHNL# 447: [VOLTAGE ST JOE 345KV]
CHNL# 446: [VOLTAGE WOLFCRK 345KV]
CHNL# 445: [VOLTAGE WICHITA 345KV]

1.1000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54 VOLTAGE

CHNL# 458: [VOLTAGE GEN 2004-003 CLR_4]
CHNL# 457: [VOLTAGE GEN 2004-003 CLR_3]
CHNL# 456: [VOLTAGE GEN 2004-003 CLR_2]
CHNL# 455: [VOLTAGE GEN 2004-003 CLR_1]
CHNL# 454: [VOLTAGE GEN 2002-022]
CHNL# 453: [VOLTAGE GEN 2002-019]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54 VOLTAGE

CHNL# 444: [VOLTAGE ROSEHIL 345KV]
CHNL# 443: [VOLTAGE NEOSHO 345KV]
CHNL# 442: [VOLTAGE BENTON 345KV]
CHNL# 441: [VOLTAGE SWISVAL 345KV]
CHNL# 440: [VOLTAGE SUMMIT 345KV]
CHNL# 439: [VOLTAGE STRANGR 345KV]

1.1000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54 VOLTAGE

CHNL# 452: [VOLTAGE MCPHERSON PLANT]
CHNL# 451: [VOLTAGE FAIRPT 345KV]

1.1000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

VOLTAGE

CHNL# 470: [VOLTAGE GEN 2004-003 CLR 16]
CHNL# 469: [VOLTAGE GEN 2004-003 CLR 15]
CHNL# 468: [VOLTAGE GEN 2004-003 CLR 14]
CHNL# 467: [VOLTAGE GEN 2004-003 CLR 13]
CHNL# 466: [VOLTAGE GEN 2004-003 CLR 12]
CHNL# 465: [VOLTAGE GEN 2004-003 CLR 11]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

VOLTAGE

CHNL# 482: [VOLTAGE GEN 2004-003 CLR 28]
CHNL# 481: [VOLTAGE GEN 2004-003 CLR 27]
CHNL# 480: [VOLTAGE GEN 2004-003 CLR 26]
CHNL# 479: [VOLTAGE GEN 2004-003 CLR 25]
CHNL# 478: [VOLTAGE GEN 2004-003 CLR 24]
CHNL# 477: [VOLTAGE GEN 2004-003 CLR 23]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

VOLTAGE

CHNL# 464: [VOLTAGE GEN 2004-003 CLR 10]
CHNL# 463: [VOLTAGE GEN 2004-003 CLR 9]
CHNL# 462: [VOLTAGE GEN 2004-003 CLR 8]
CHNL# 461: [VOLTAGE GEN 2004-003 CLR 7]
CHNL# 460: [VOLTAGE GEN 2004-003 CLR 6]
CHNL# 459: [VOLTAGE GEN 2004-003 CLR 5]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54

VOLTAGE

CHNL# 476: [VOLTAGE GEN 2004-003 CLR 22]
CHNL# 475: [VOLTAGE GEN 2004-003 CLR 21]
CHNL# 474: [VOLTAGE GEN 2004-003 CLR 20]
CHNL# 473: [VOLTAGE GEN 2004-003 CLR 19]
CHNL# 472: [VOLTAGE GEN 2004-003 CLR 18]
CHNL# 471: [VOLTAGE GEN 2004-003 CLR 17]

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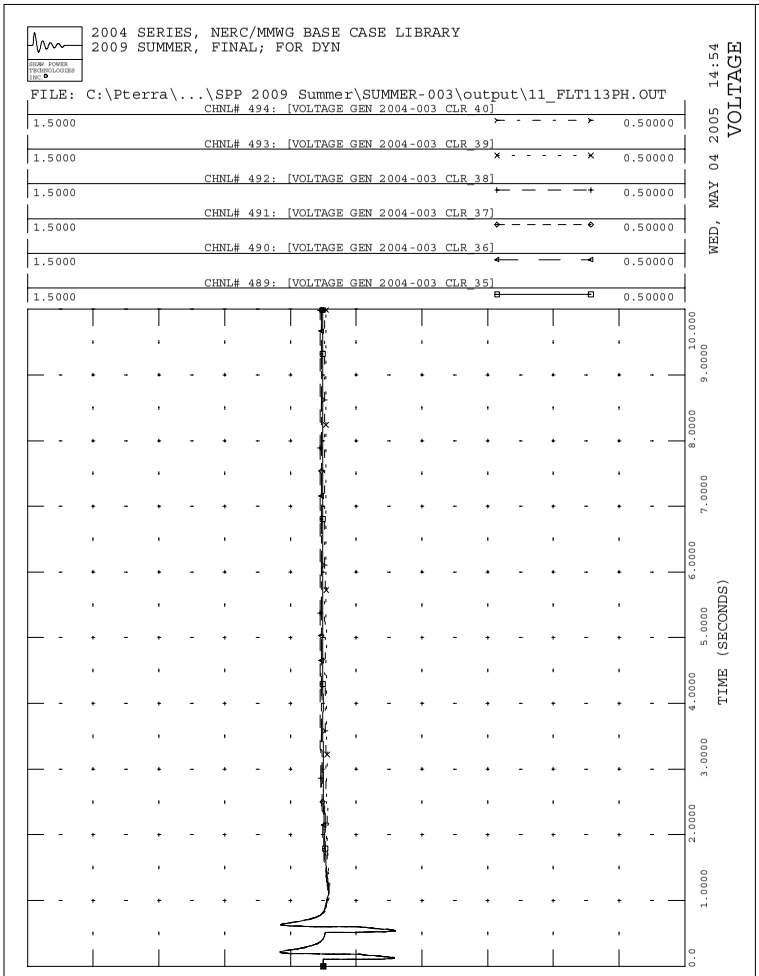
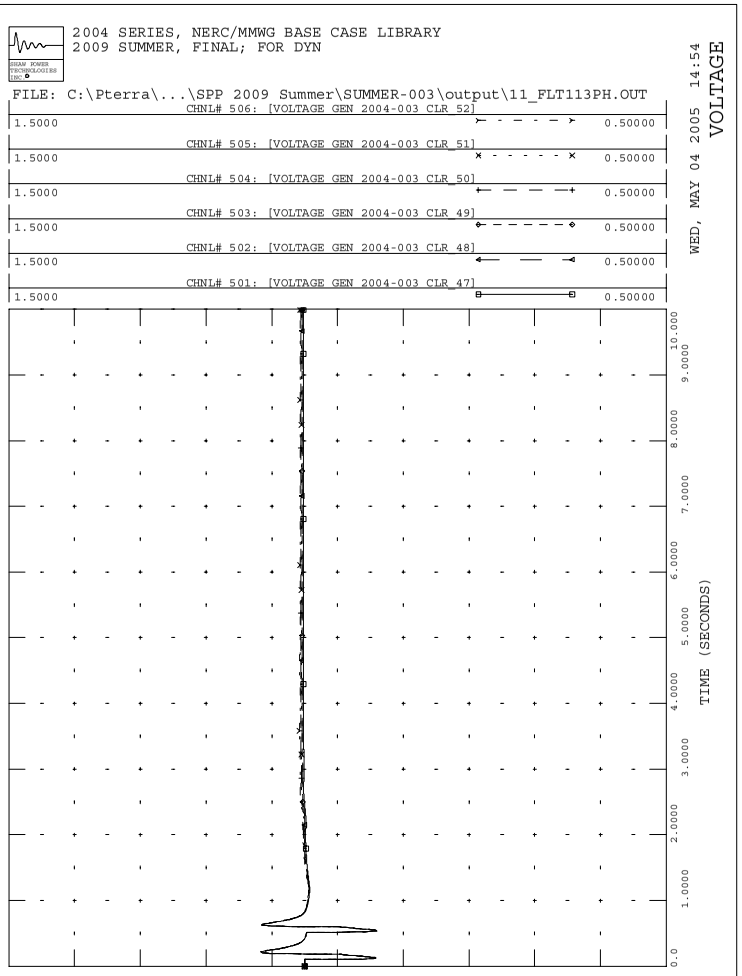
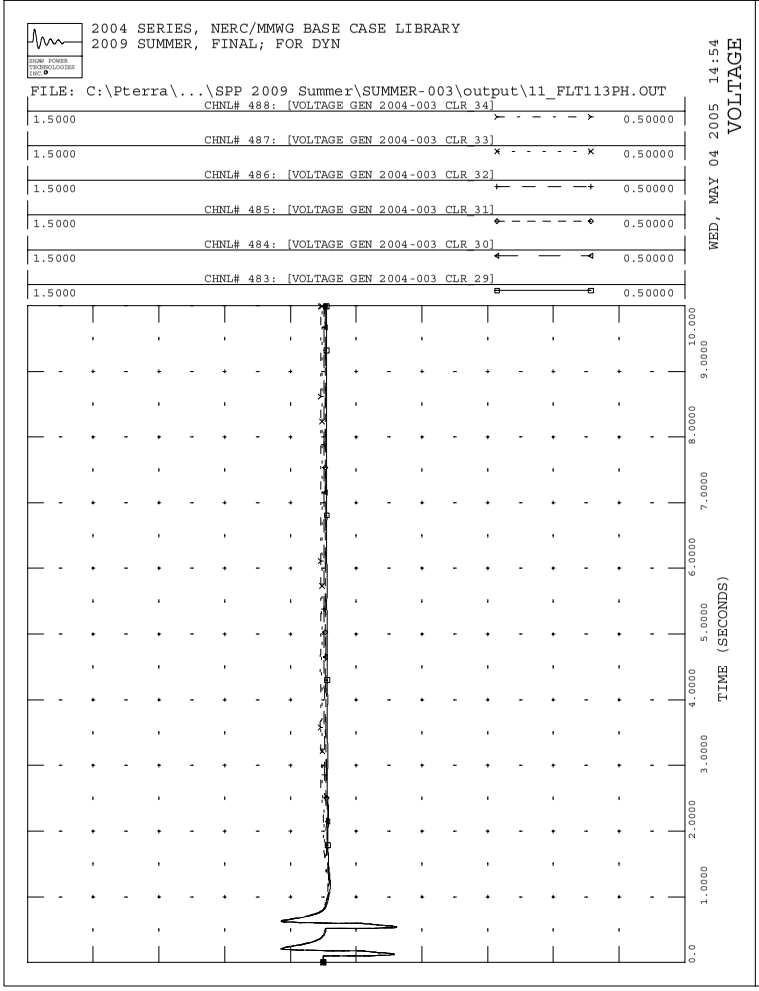
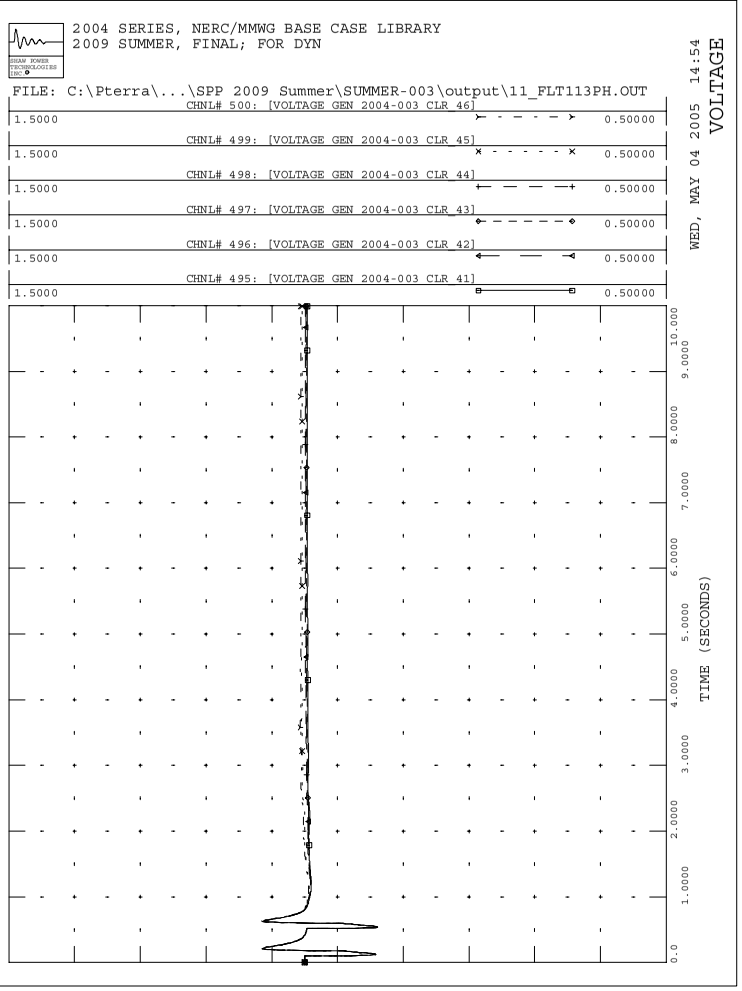
0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SHAW POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT
CHNL# 494: [VOLTAGE GEN 2004-003 CLR 40]
CHNL# 493: [VOLTAGE GEN 2004-003 CLR_39]
CHNL# 492: [VOLTAGE GEN 2004-003 CLR_38]
CHNL# 491: [VOLTAGE GEN 2004-003 CLR 37]
CHNL# 490: [VOLTAGE GEN 2004-003 CLR_36]
CHNL# 489: [VOLTAGE GEN 2004-003 CLR_35]
1.5000
0.50000
0.0
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000
10.000
TIME (SECONDS)
WED, MAY 04 2005 14:54
VOLTAGE


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SHAW POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT
CHNL# 506: [VOLTAGE GEN 2004-003 CLR 52]
CHNL# 505: [VOLTAGE GEN 2004-003 CLR_51]
CHNL# 504: [VOLTAGE GEN 2004-003 CLR_50]
CHNL# 503: [VOLTAGE GEN 2004-003 CLR 49]
CHNL# 502: [VOLTAGE GEN 2004-003 CLR_48]
CHNL# 501: [VOLTAGE GEN 2004-003 CLR_47]
1.5000
0.50000
0.0
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000
10.000
TIME (SECONDS)
WED, MAY 04 2005 14:54
VOLTAGE


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SHAW POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT
CHNL# 488: [VOLTAGE GEN 2004-003 CLR 34]
CHNL# 487: [VOLTAGE GEN 2004-003 CLR_33]
CHNL# 486: [VOLTAGE GEN 2004-003 CLR_32]
CHNL# 485: [VOLTAGE GEN 2004-003 CLR_31]
CHNL# 484: [VOLTAGE GEN 2004-003 CLR_30]
CHNL# 483: [VOLTAGE GEN 2004-003 CLR_29]
1.5000
0.50000
0.0
1.0000
2.0000
3.0000
4.0000
5.0000
6.0000
7.0000
8.0000
9.0000
10.000
TIME (SECONDS)
WED, MAY 04 2005 14:54
VOLTAGE


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN
SHAW POWER TECHNOLOGIES INC.
FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT
CHNL# 500: [VOLTAGE GEN 2004-003 CLR 46]
CHNL# 499: [VOLTAGE GEN 2004-003 CLR_45]
CHNL# 498: [VOLTAGE GEN 2004-003 CLR_44]
CHNL# 497: [VOLTAGE GEN 2004-003 CLR_43]
CHNL# 496: [VOLTAGE GEN 2004-003 CLR_42]
CHNL# 495: [VOLTAGE GEN 2004-003 CLR_41]
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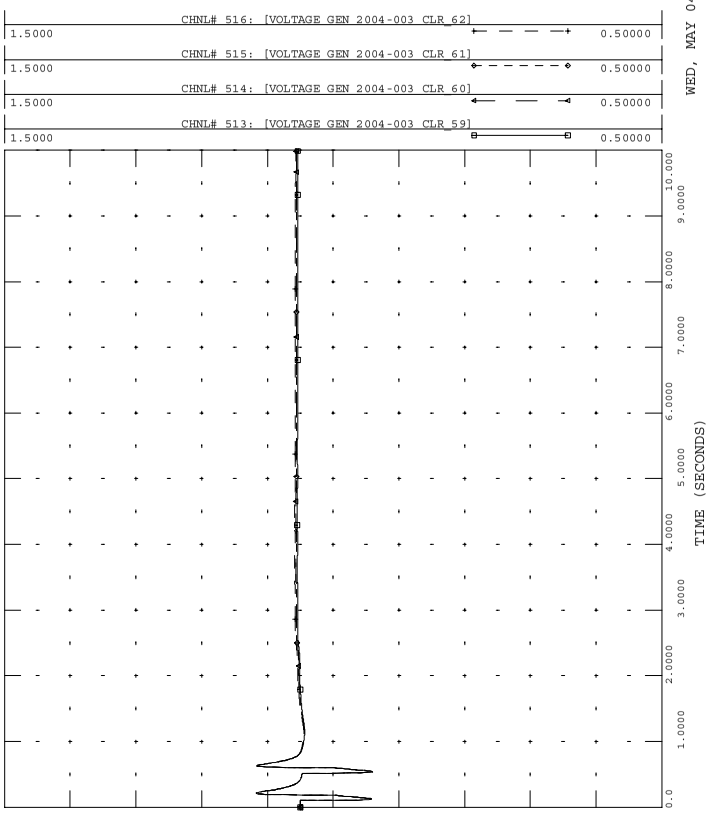
VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

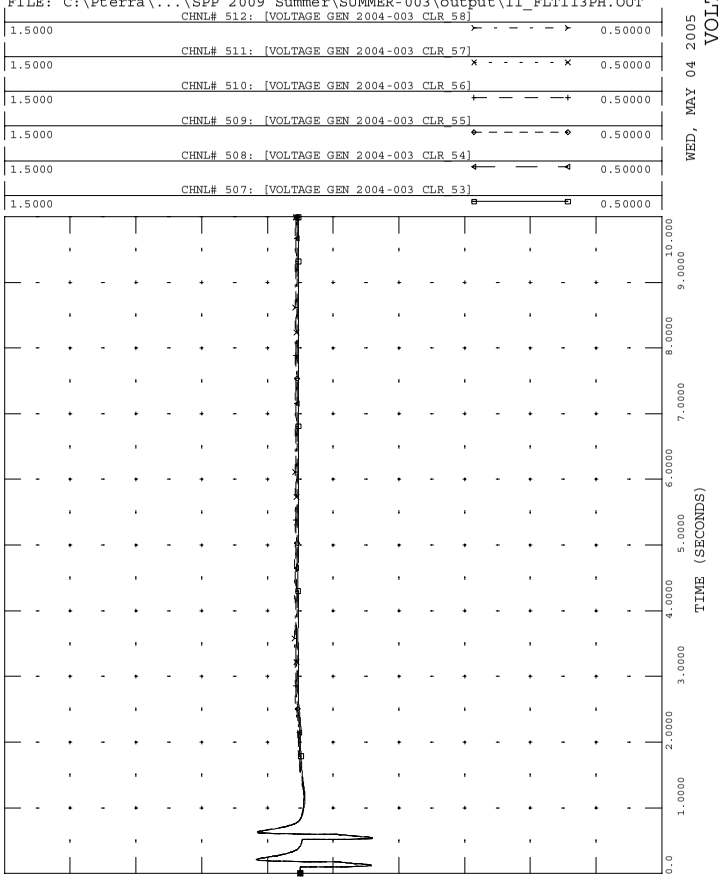
WED, MAY 04 2005 14:54 VOLTAGE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2009 SUMMER, FINAL; FOR DYN

FILE: C:\Pterra\...\SPP 2009 Summer\SUMMER-003\output\11_FLT113PH.OUT

WED, MAY 04 2005 14:54 VOLTAGE

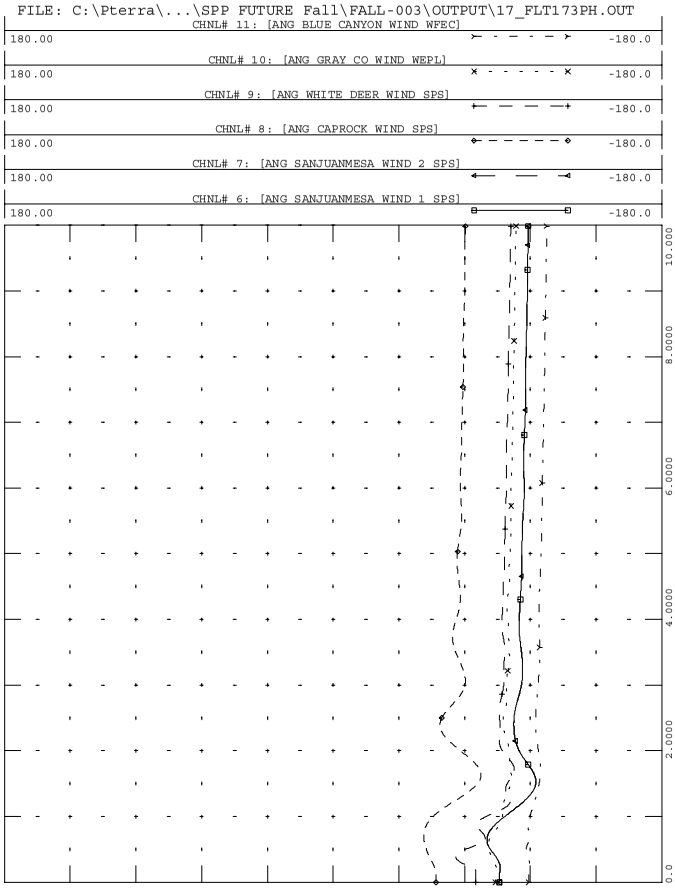


A-2 Sample Plots for Rotor Angle, Voltage, and Speed for Fall Loading Conditions

1. Disturbance #17 (Fault on the Nichols to Whitaker, 115 kV line, near Whitaker)

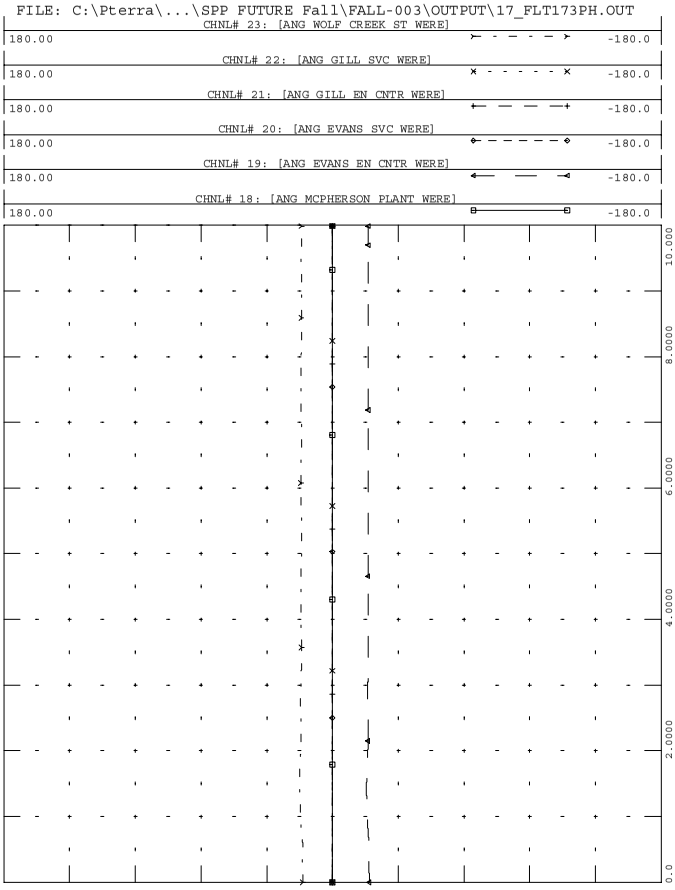
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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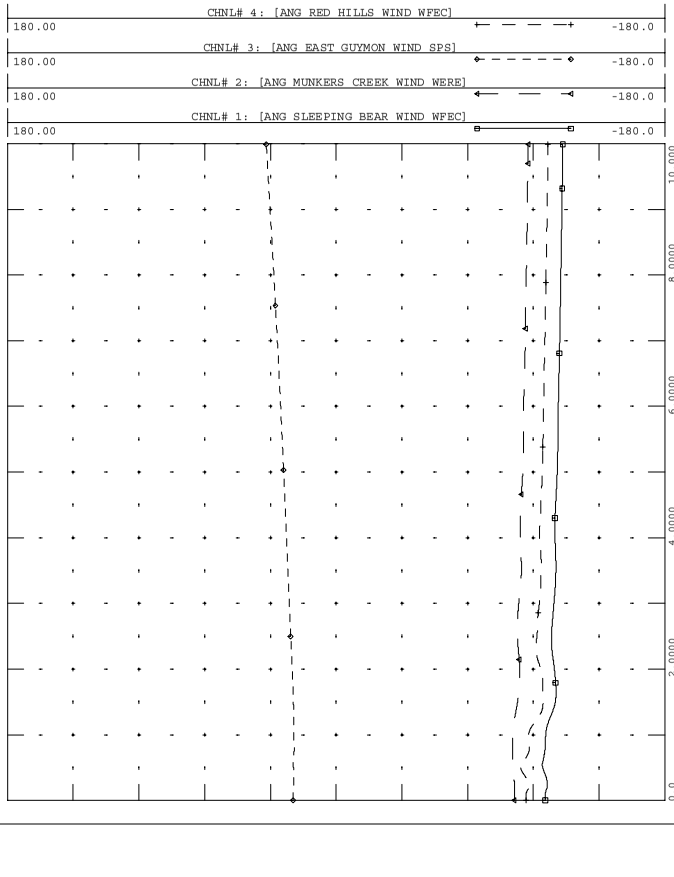

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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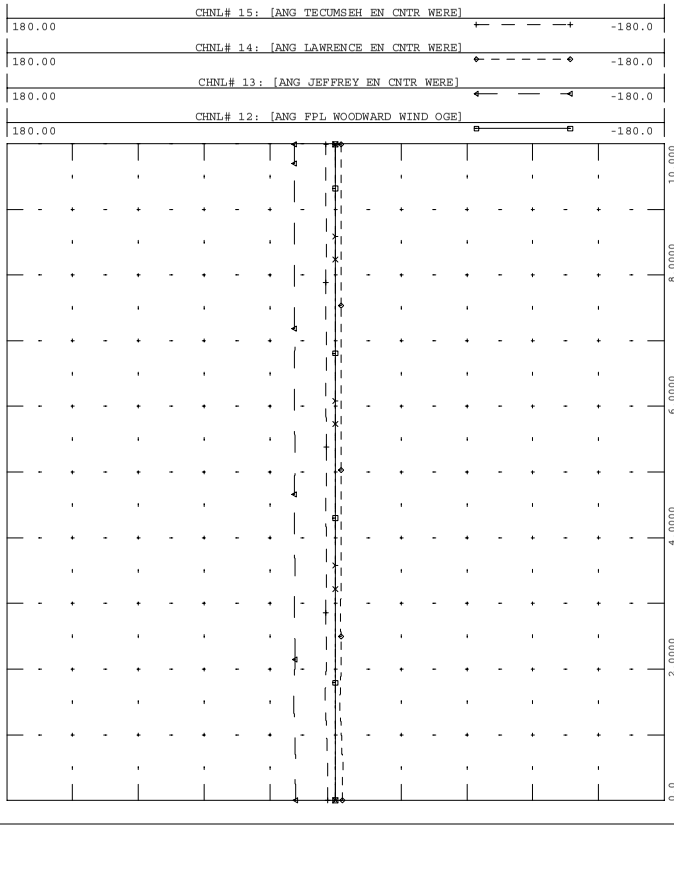
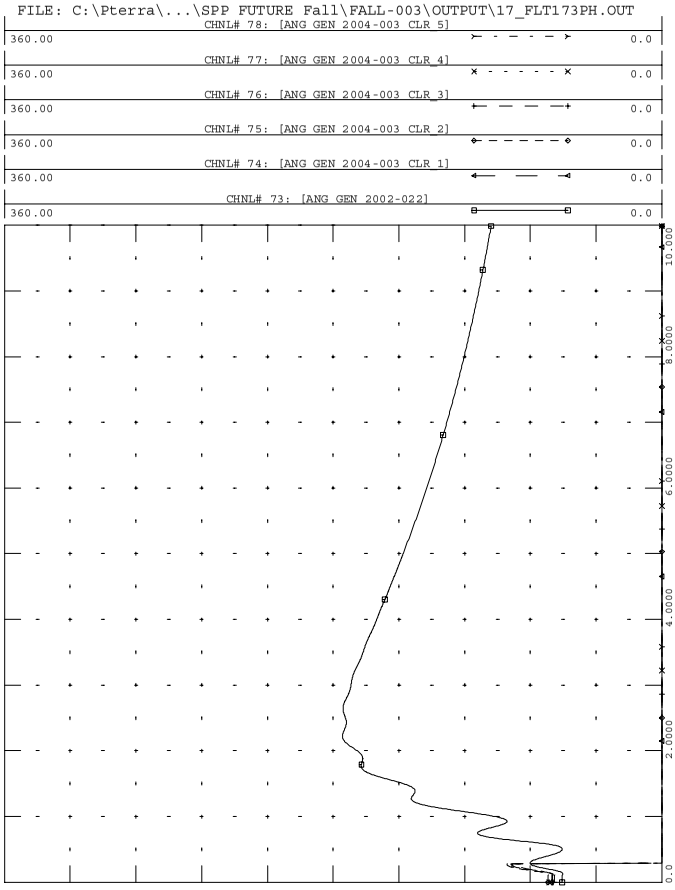


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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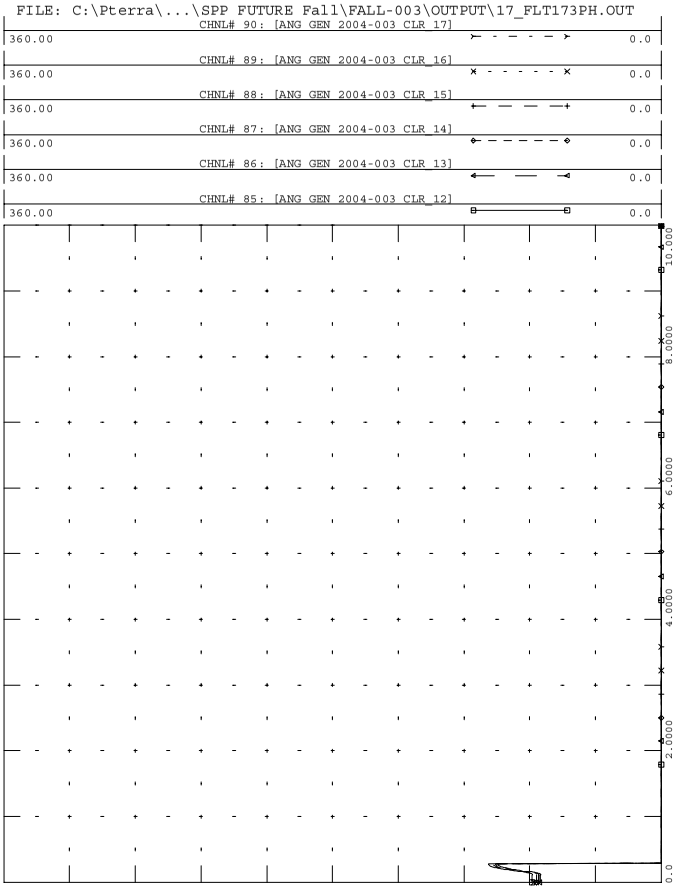
TUE, MAY 03 2005 15:42

ROTOR ANGLE

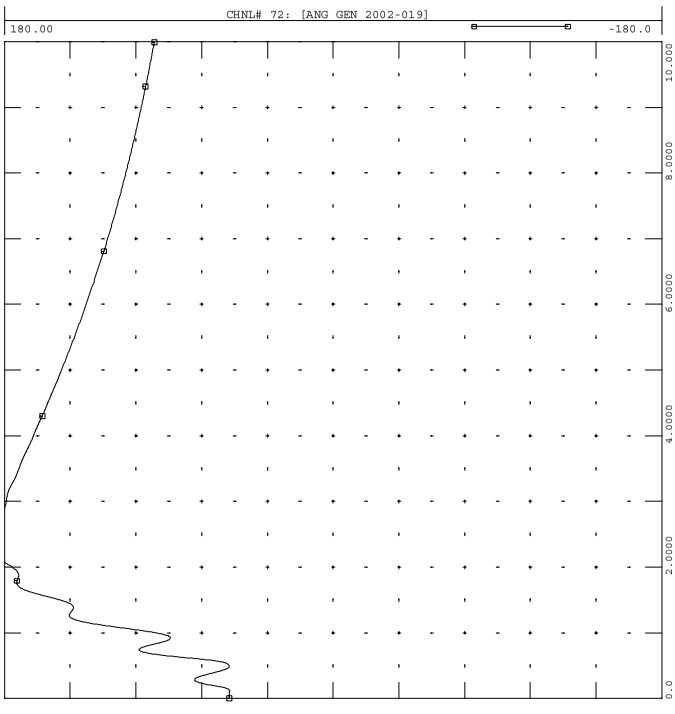


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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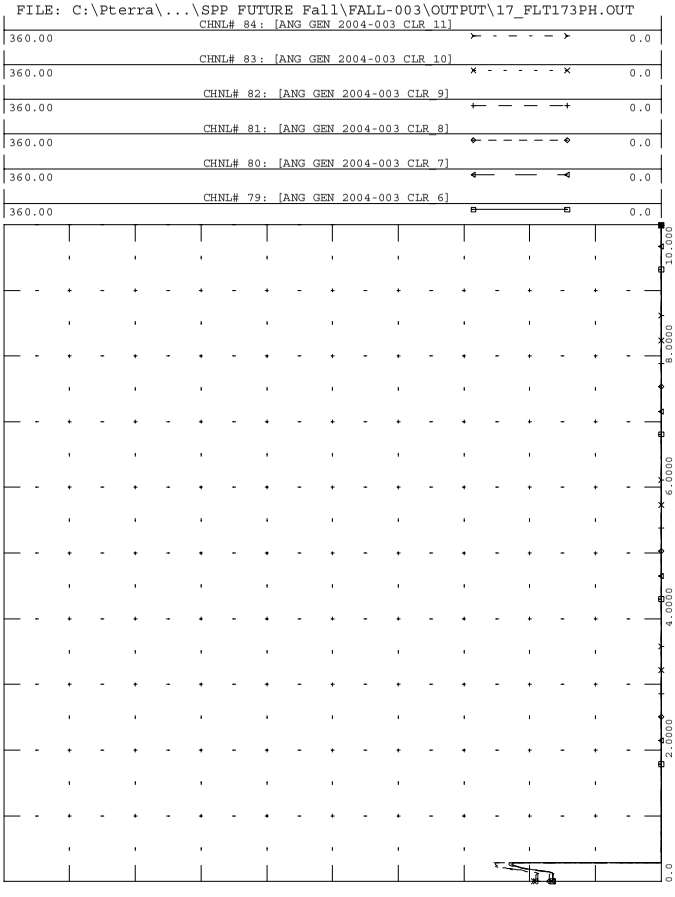
TUE, MAY 03 2005 15:42

ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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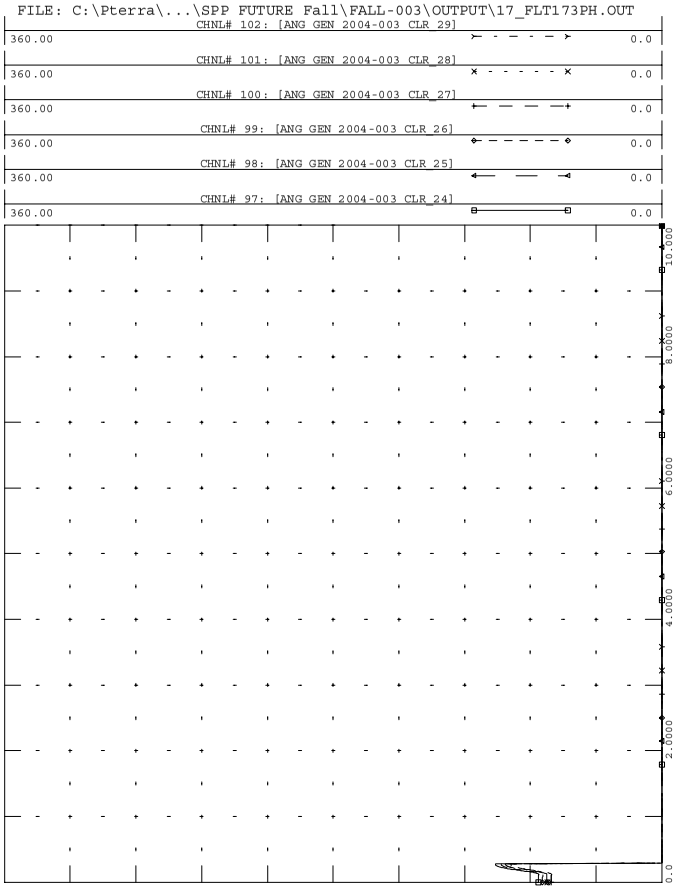

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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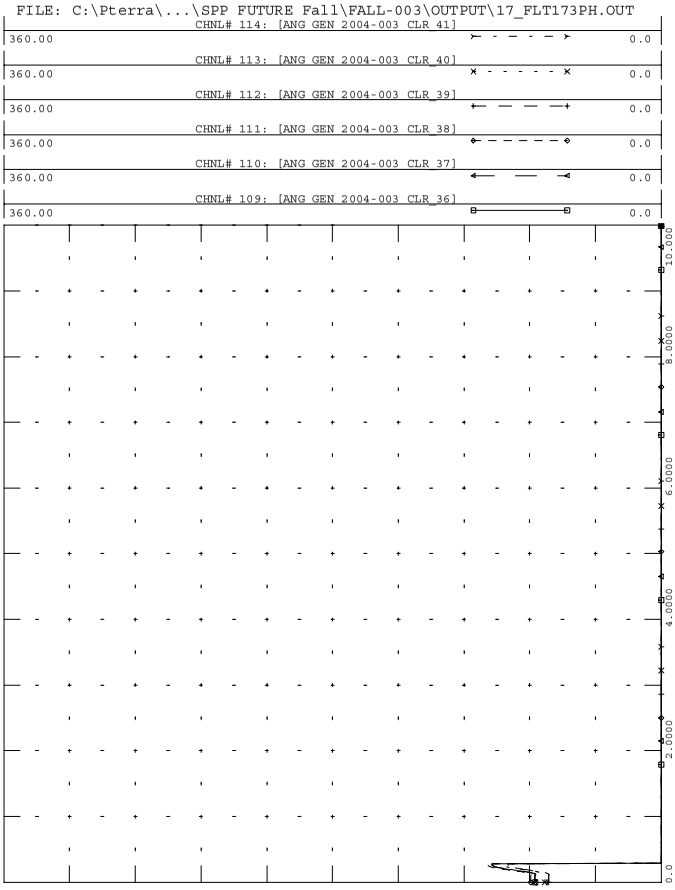
ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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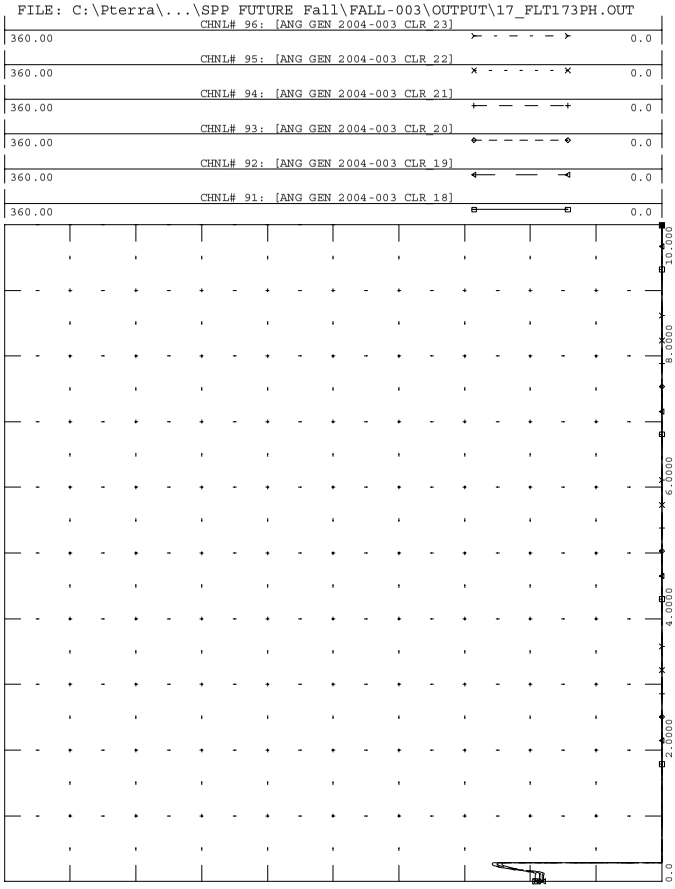

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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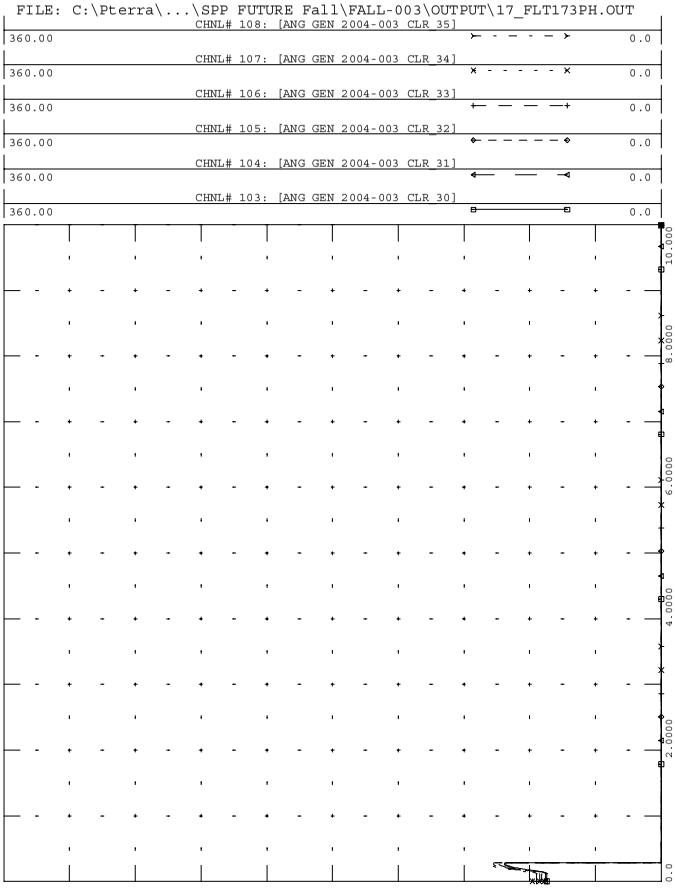

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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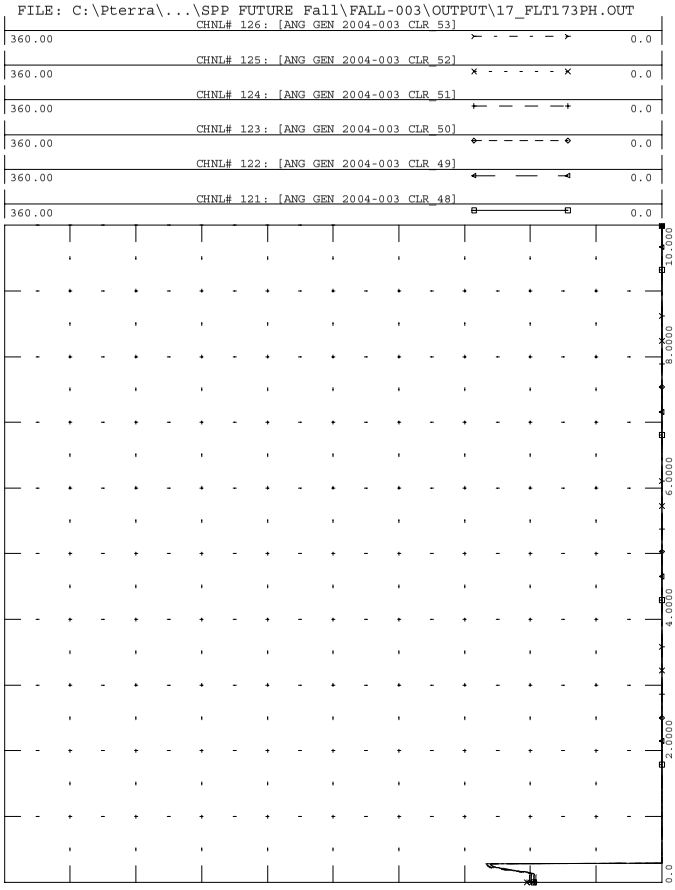
ROTOR ANGLE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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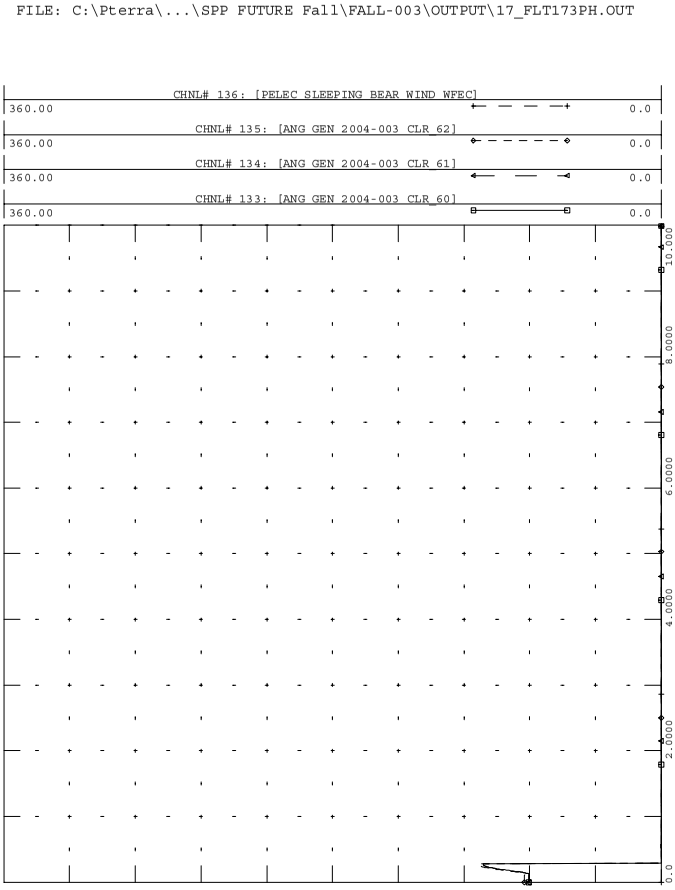

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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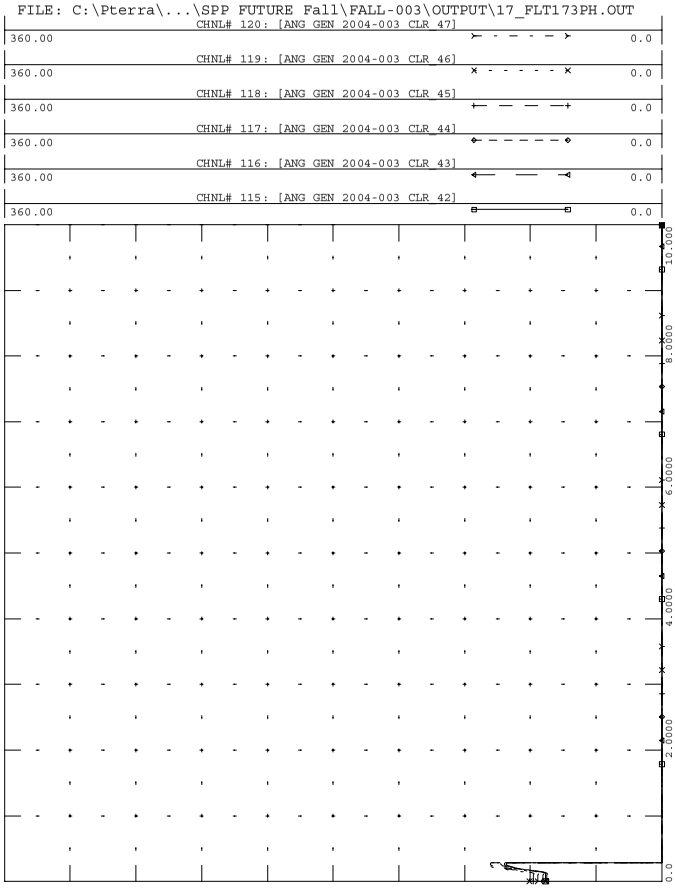

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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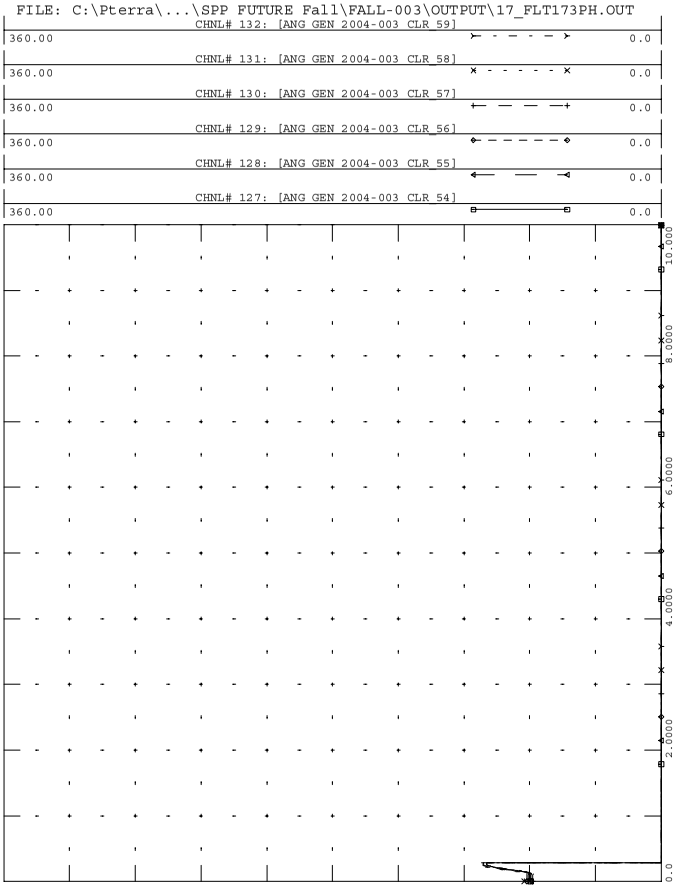

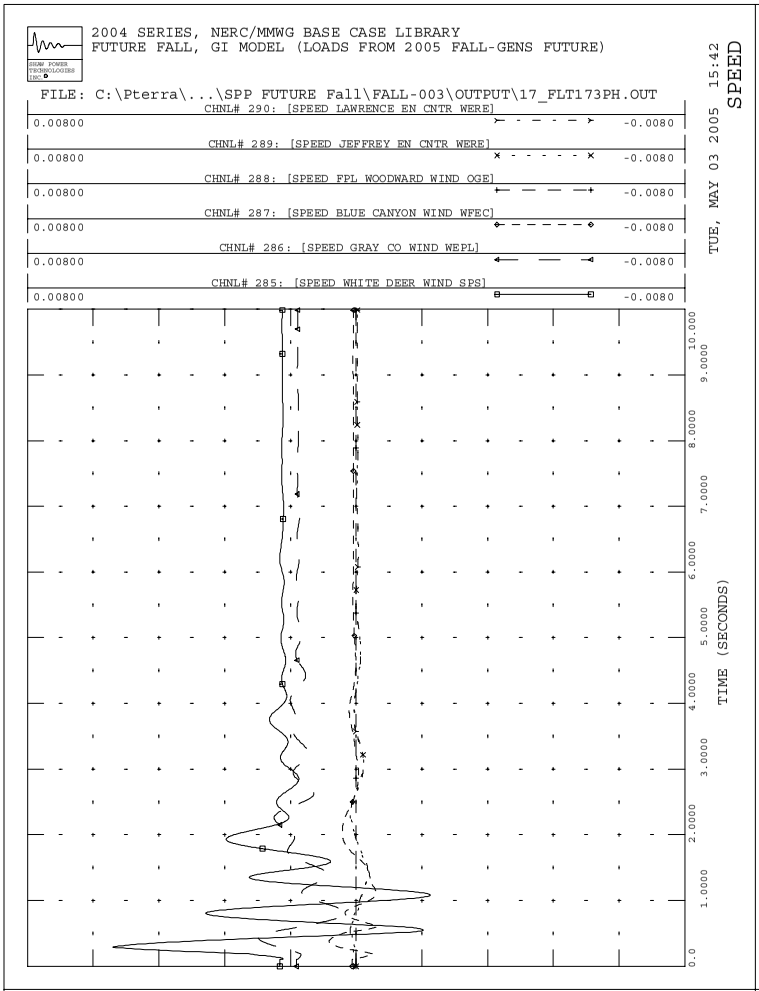
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 290: [SPEED LAWRENCE EN CNTR WERE]
CHNL# 289: [SPEED JEFFREY EN CNTR WERE]
CHNL# 288: [SPEED FPL WOODWARD WIND OGE]
CHNL# 287: [SPEED BLUE CANYON WIND WFEC]
CHNL# 286: [SPEED GRAY CO WIND WEPL]
CHNL# 285: [SPEED WHITE DEER WIND SPS]
0.00800
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TUE, MAY 03 2005 15:42
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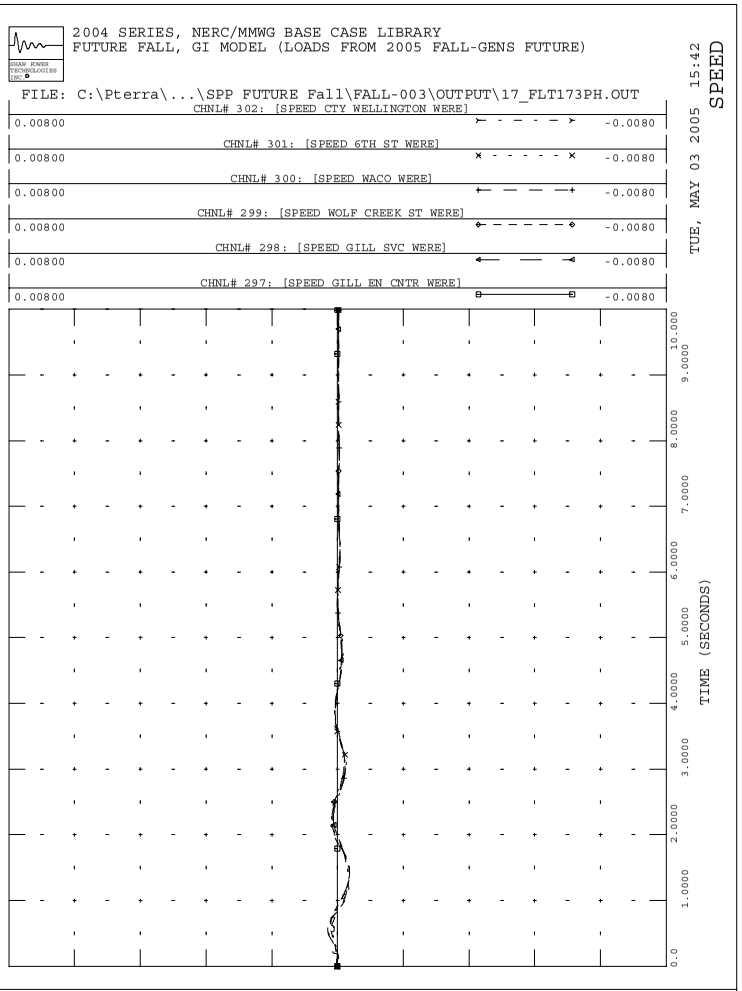
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 302: [SPEED CTY WELLINGTON WERE]
CHNL# 301: [SPEED 6TH ST WERE]
CHNL# 300: [SPEED WACO WERE]
CHNL# 299: [SPEED WOLF CREEK ST WERE]
CHNL# 298: [SPEED GILL SVC WERE]
CHNL# 297: [SPEED GILL EN CNTR WERE]
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TUE, MAY 03 2005 15:42
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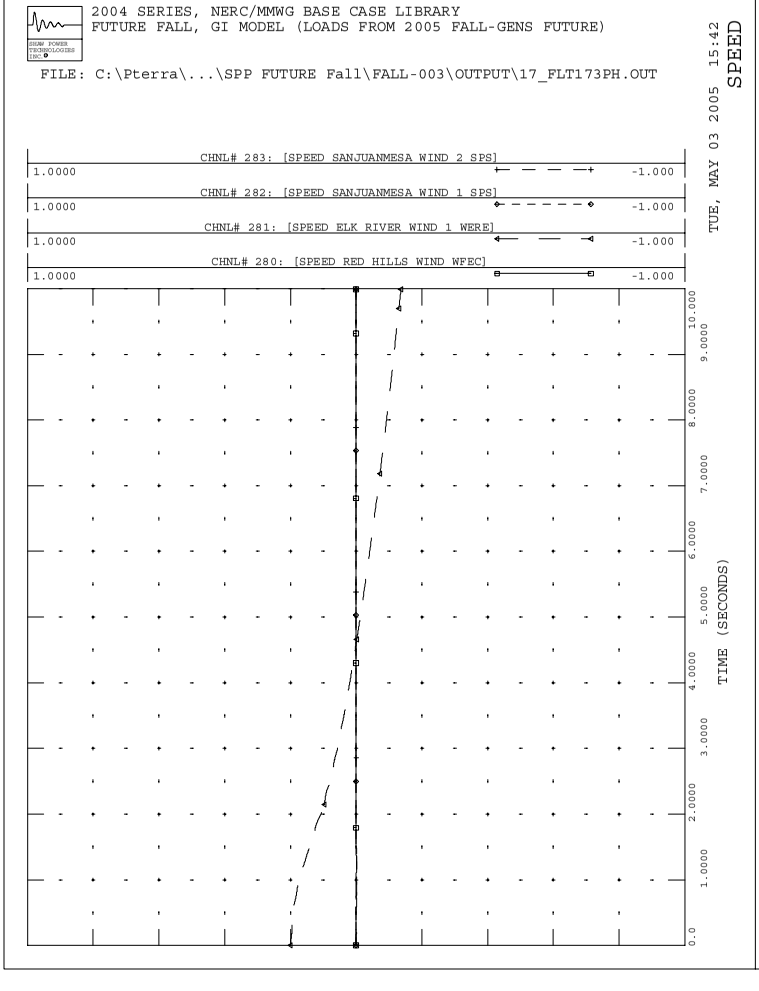
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 283: [SPEED SANJUANMESA WIND 2 SPS]
CHNL# 282: [SPEED SANJUANMESA WIND 1 SPS]
CHNL# 281: [SPEED ELK RIVER WIND 1 WERE]
CHNL# 280: [SPEED RED HILLS WIND WFEC]
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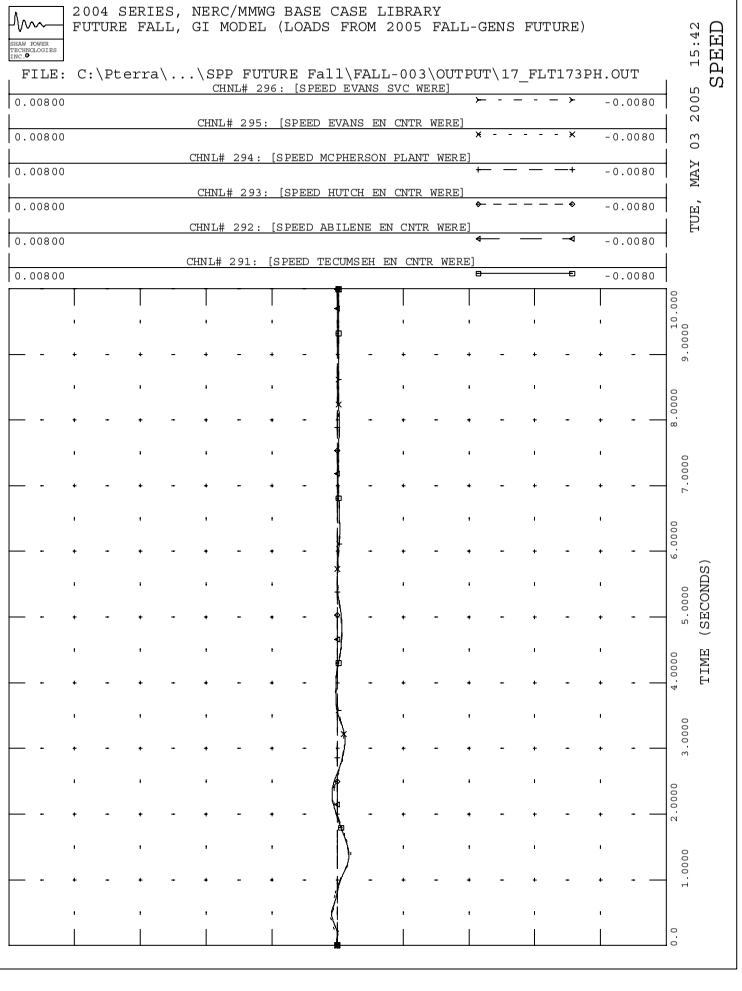
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 296: [SPEED EVANS SVC WERE]
CHNL# 295: [SPEED EVANS EN CNTR WERE]
CHNL# 294: [SPEED MCPHERSON PLANT WERE]
CHNL# 293: [SPEED HUTCH EN CNTR WERE]
CHNL# 292: [SPEED ABILENE EN CNTR WERE]
CHNL# 291: [SPEED TECUMSEH EN CNTR WERE]
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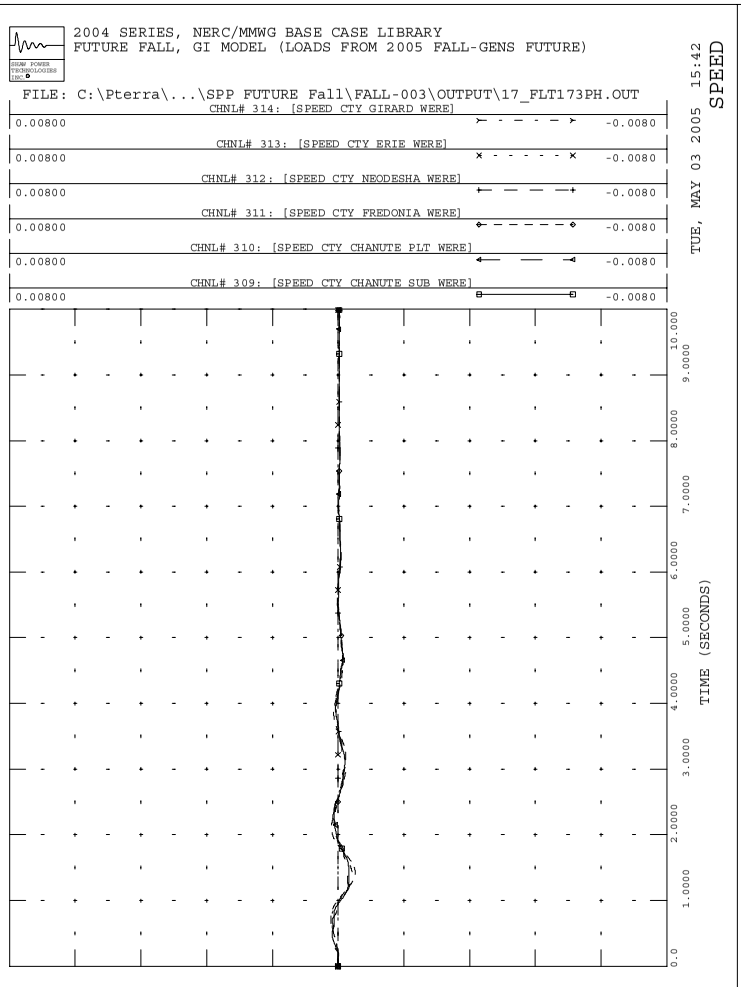
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 314: [SPEED CTY GIRARD WERE]
CHNL# 313: [SPEED CTY ERIE WERE]
CHNL# 312: [SPEED CTY NEODESHA WERE]
CHNL# 311: [SPEED CTY FREDONIA WERE]
CHNL# 310: [SPEED CTY CHANUTE PLT WERE]
CHNL# 309: [SPEED CTY CHANUTE SUB WERE]
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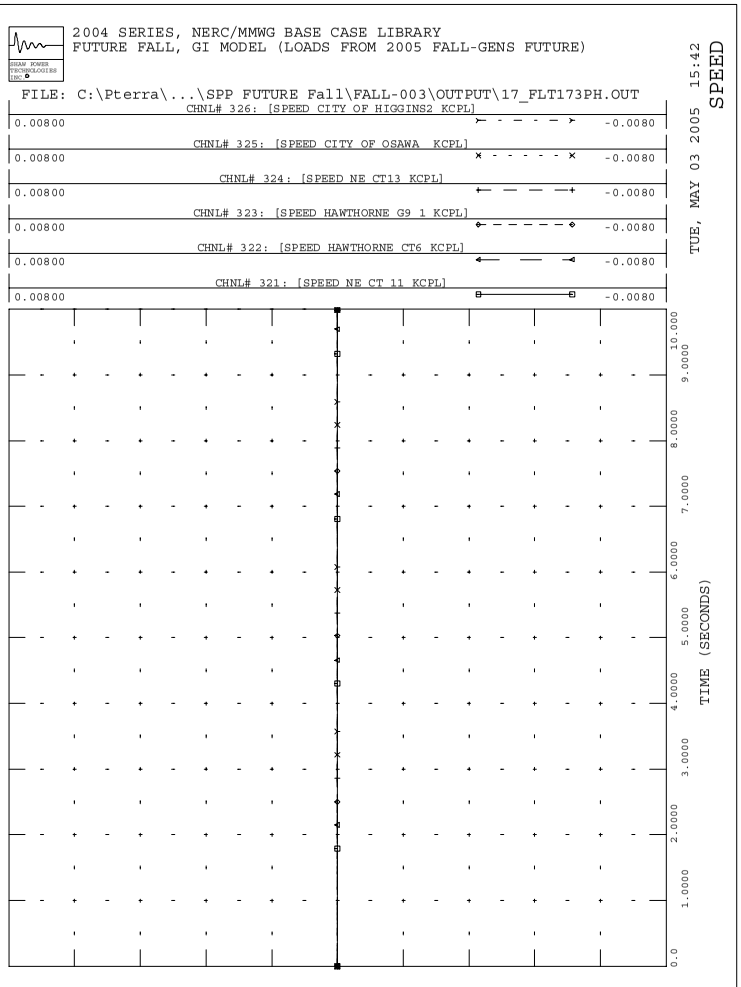
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 326: [SPEED CITY OF HIGGINS2 KCPL]
CHNL# 325: [SPEED CITY OF OSAWA KCPL]
CHNL# 324: [SPEED NE CT13 KCPL]
CHNL# 323: [SPEED HAWTHORNE G9 1 KCPL]
CHNL# 322: [SPEED HAWTHORNE CT6 KCPL]
CHNL# 321: [SPEED NE CT 11 KCPL]
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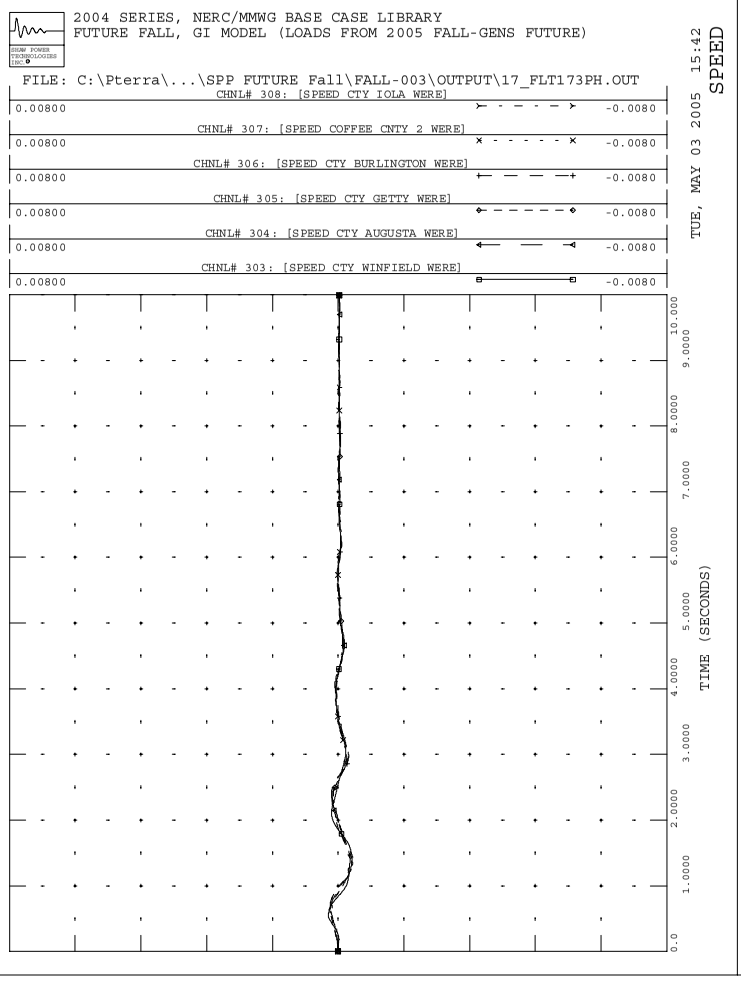
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 308: [SPEED CTY IOLA WERE]
CHNL# 307: [SPEED COFFEE CNTY 2 WERE]
CHNL# 306: [SPEED CTY BURLINGTON WERE]
CHNL# 305: [SPEED CTY GETTY WERE]
CHNL# 304: [SPEED CTY AUGUSTA WERE]
CHNL# 303: [SPEED CTY WINFIELD WERE]
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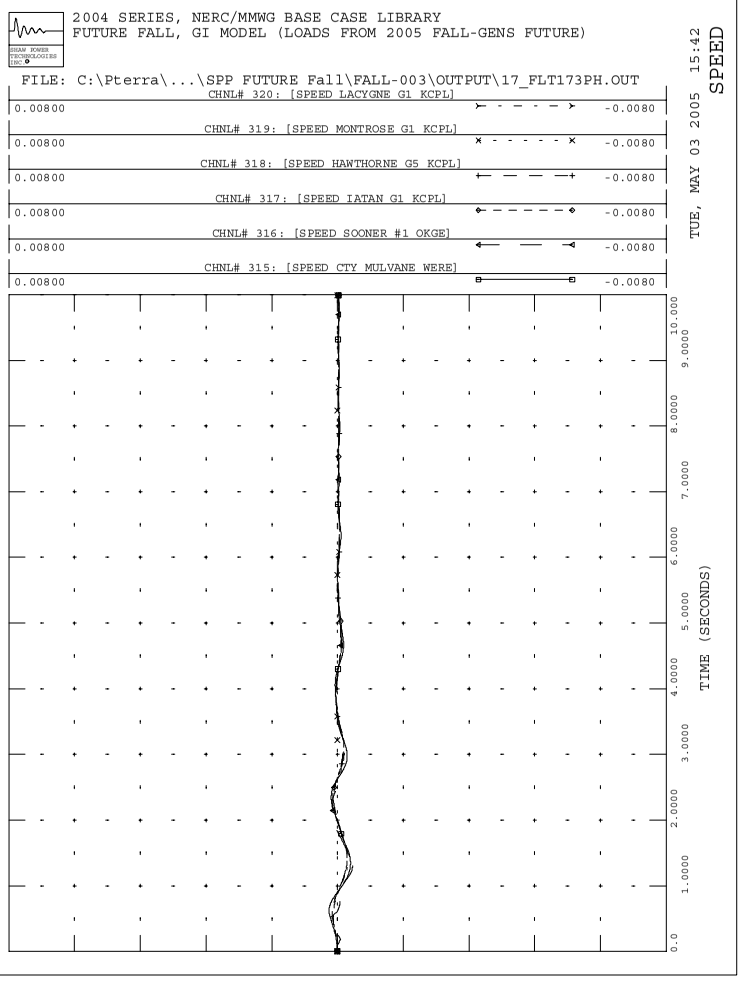
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 320: [SPEED LACYGNE G1 KCPL]
CHNL# 319: [SPEED MONTROSE G1 KCPL]
CHNL# 318: [SPEED HAWTHORNE G5 KCPL]
CHNL# 317: [SPEED IATAN G1 KCPL]
CHNL# 316: [SPEED SOONER #1 OKGE]
CHNL# 315: [SPEED CTY MULVANE WERE]
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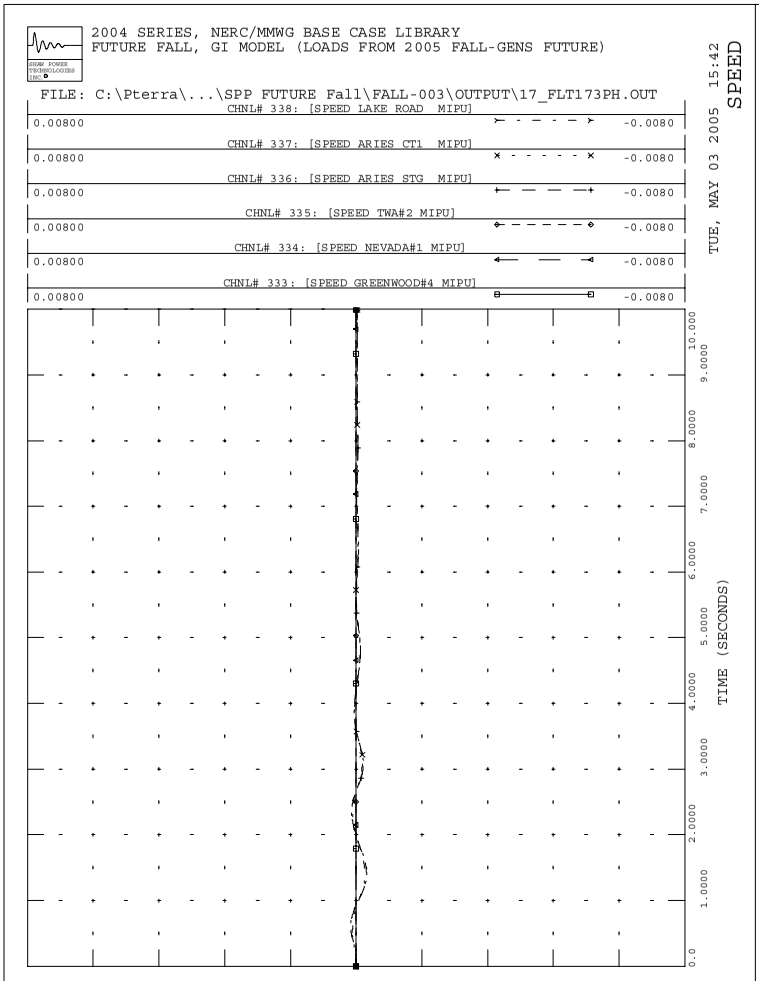
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 338: [SPEED LAKE ROAD MIPU]
CHNL# 337: [SPEED ARIES CT1 MIPU]
CHNL# 336: [SPEED ARIES STG MIPU]
CHNL# 335: [SPEED TWA#2 MIPU]
CHNL# 334: [SPEED NEVADA#1 MIPU]
CHNL# 333: [SPEED GREENWOOD#4 MIPU]
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TUE, MAY 03 2005 15:42
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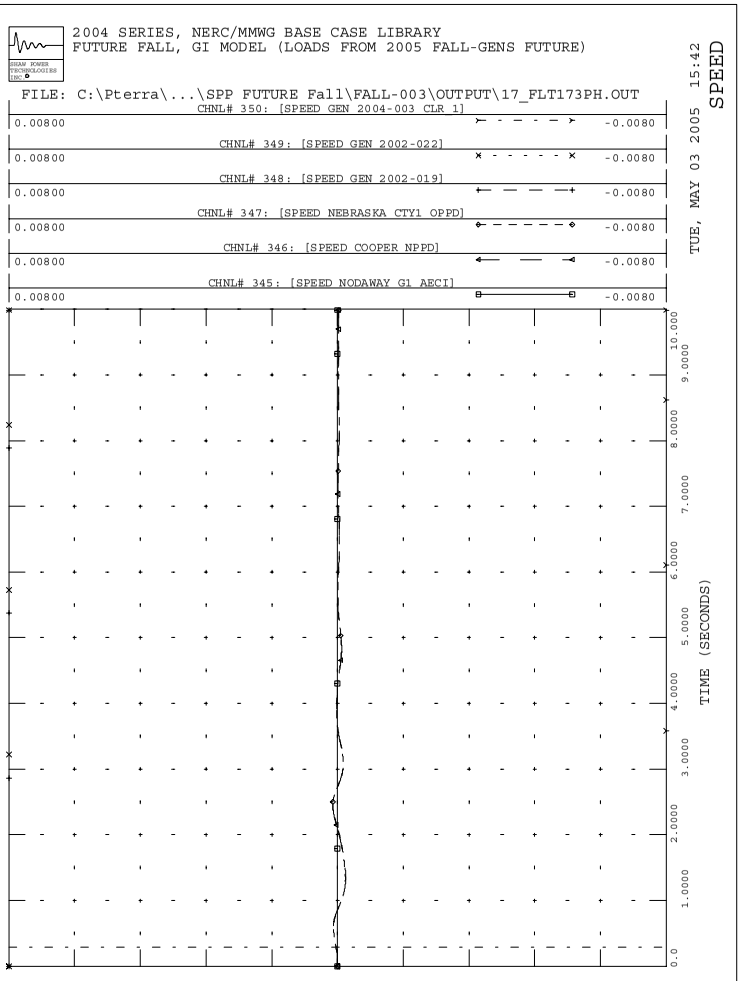
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 350: [SPEED GEN 2004-003 CLR 1]
CHNL# 349: [SPEED GEN 2002-022]
CHNL# 348: [SPEED GEN 2002-019]
CHNL# 347: [SPEED NEBRASKA CTY1 OPPD]
CHNL# 346: [SPEED COOPER NPPD]
CHNL# 345: [SPEED NODAWAY G1 AECI]
0.00800
-0.0080
TUE, MAY 03 2005 15:42
SPEED
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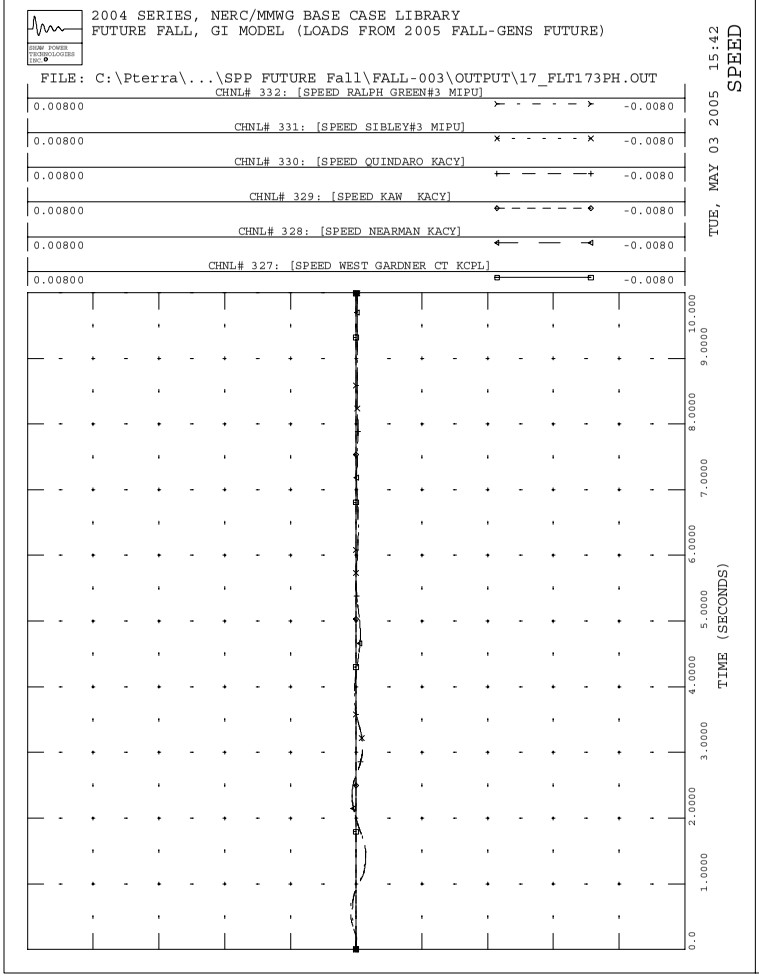
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 332: [SPEED RALPH GREEN#3 MIPU]
CHNL# 331: [SPEED SIBLEY#3 MIPU]
CHNL# 330: [SPEED QUINDARO KACY]
CHNL# 329: [SPEED KAW KACY]
CHNL# 328: [SPEED NEARMAN KACY]
CHNL# 327: [SPEED WEST GARDNER CT KCPL]
0.00800
-0.0080
TUE, MAY 03 2005 15:42
SPEED
TIME (SECONDS)
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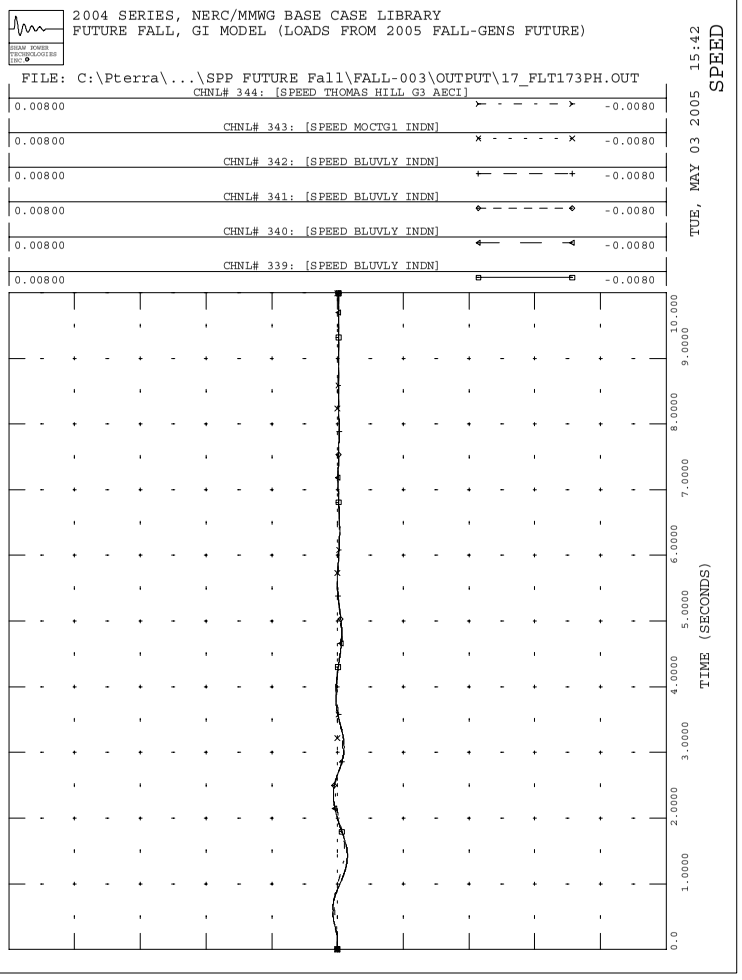
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT
CHNL# 344: [SPEED THOMAS HILL G3 AECI]
CHNL# 343: [SPEED MOCTG1 INDN]
CHNL# 342: [SPEED BLUVLY INDN]
CHNL# 341: [SPEED BLUVLY INDN]
CHNL# 340: [SPEED BLUVLY INDN]
CHNL# 339: [SPEED BLUVLY INDN]
0.00800
-0.0080
TUE, MAY 03 2005 15:42
SPEED
TIME (SECONDS)
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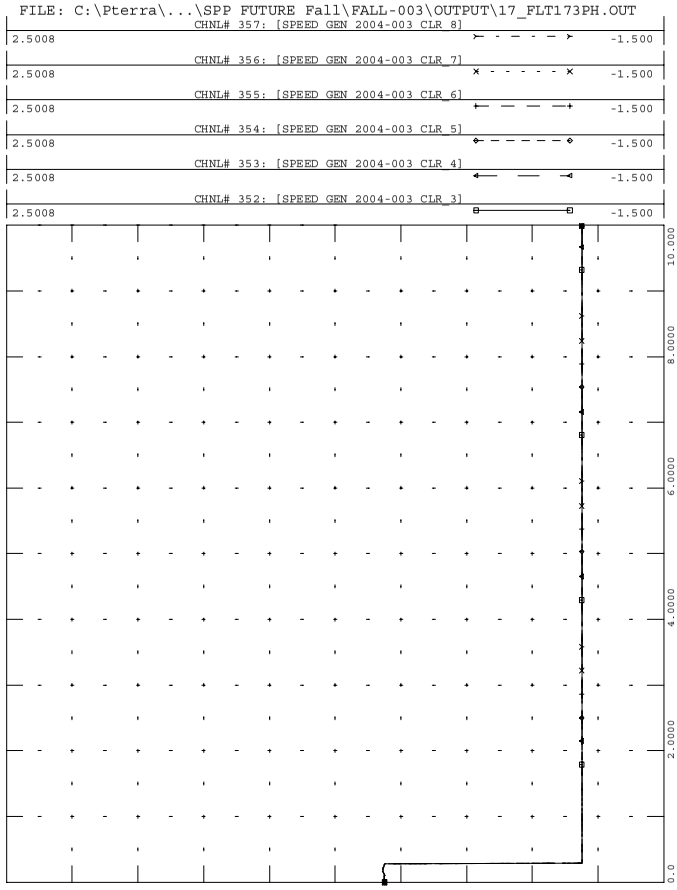
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

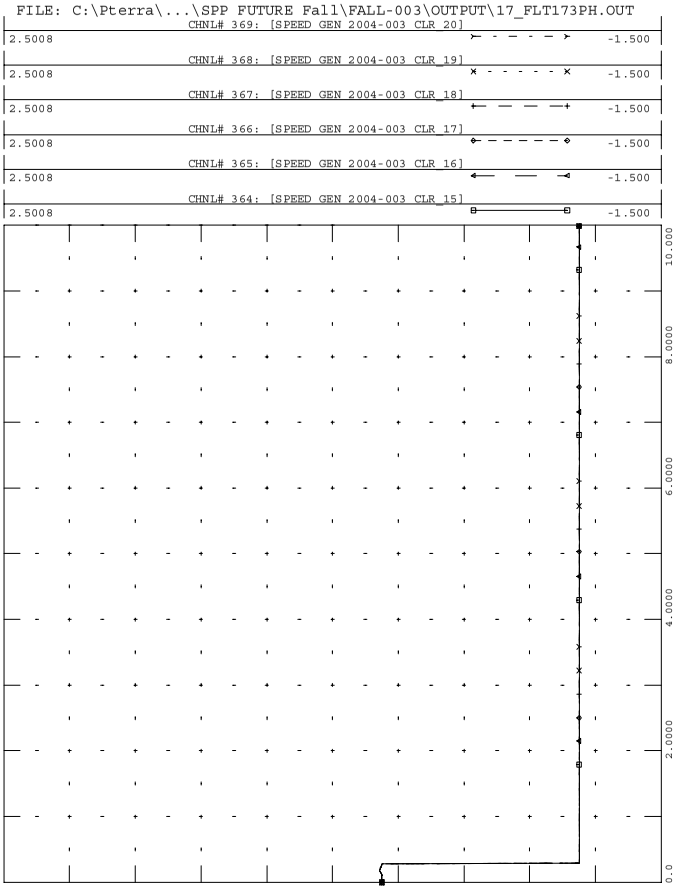
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



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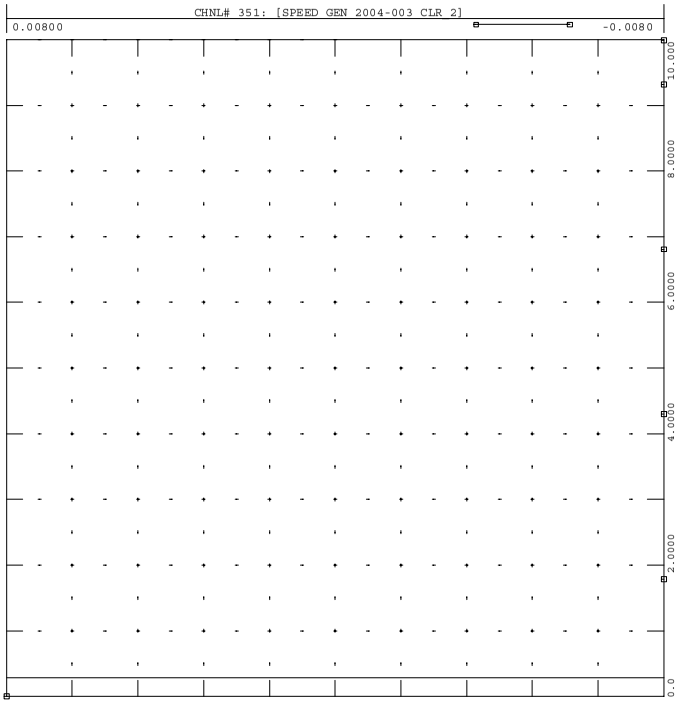
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



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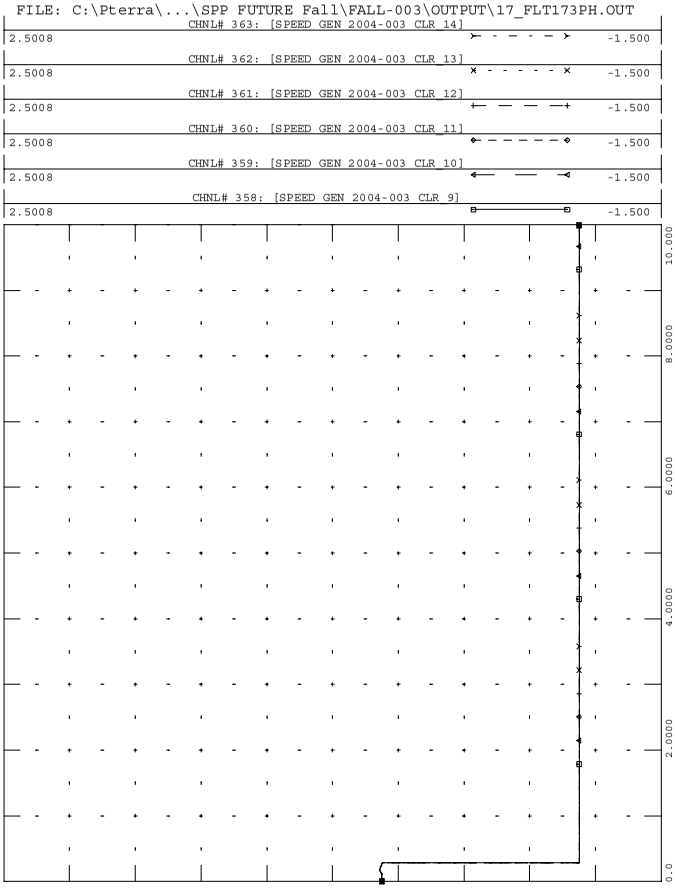
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

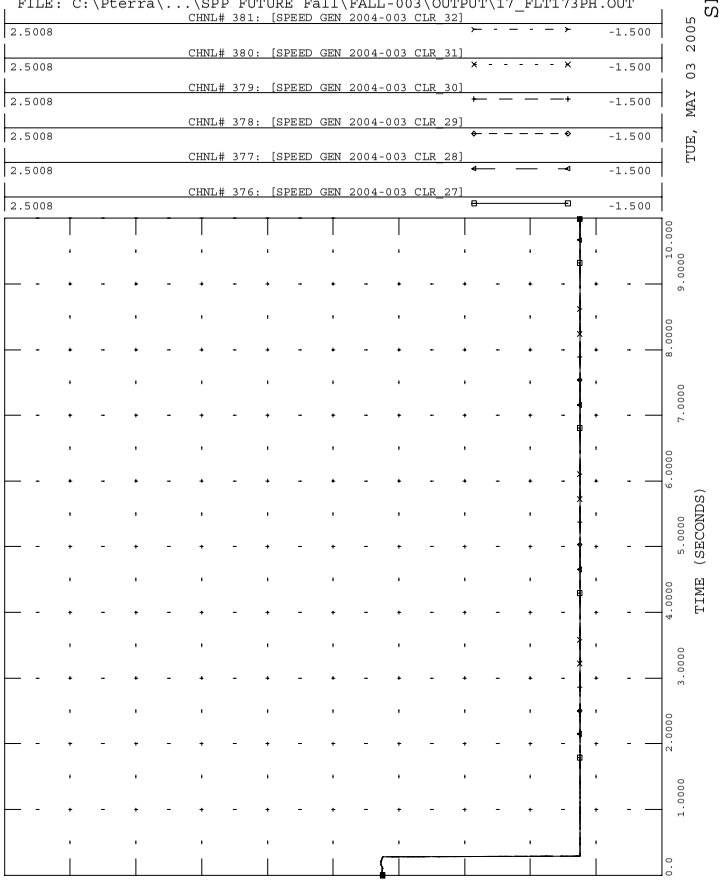
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 SPEED

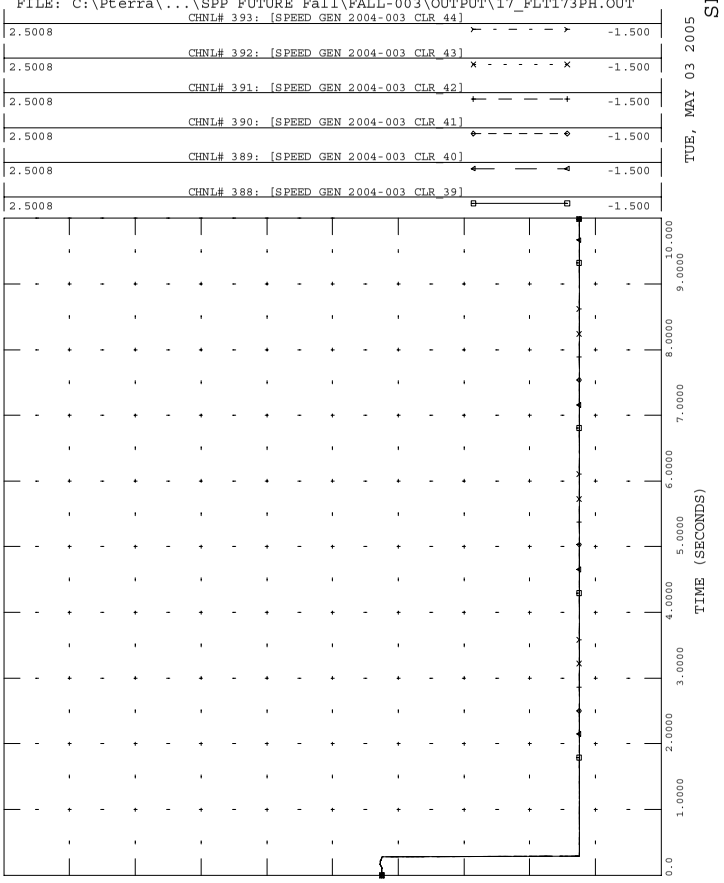
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



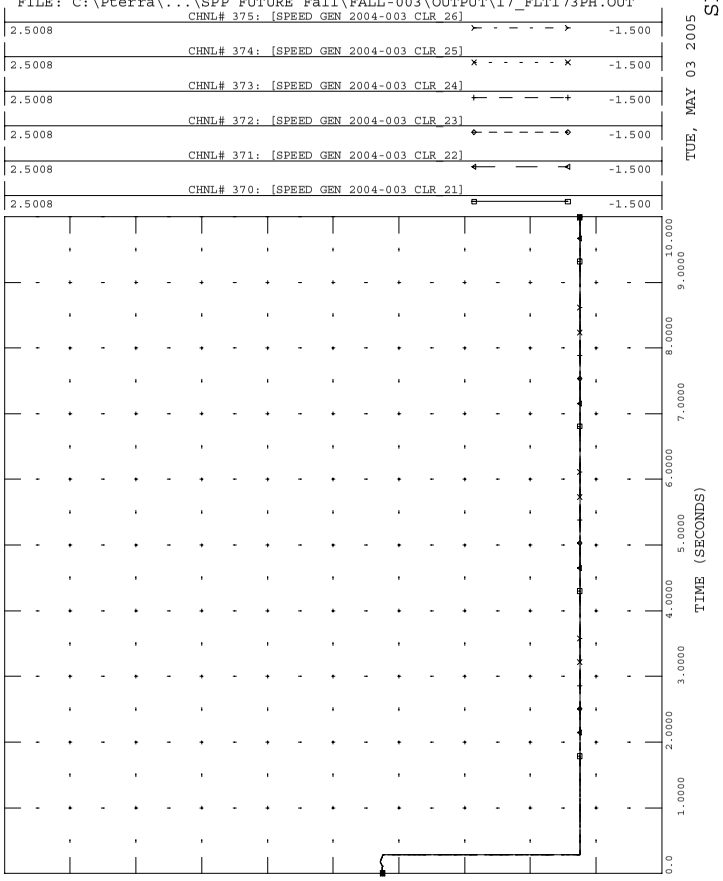
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



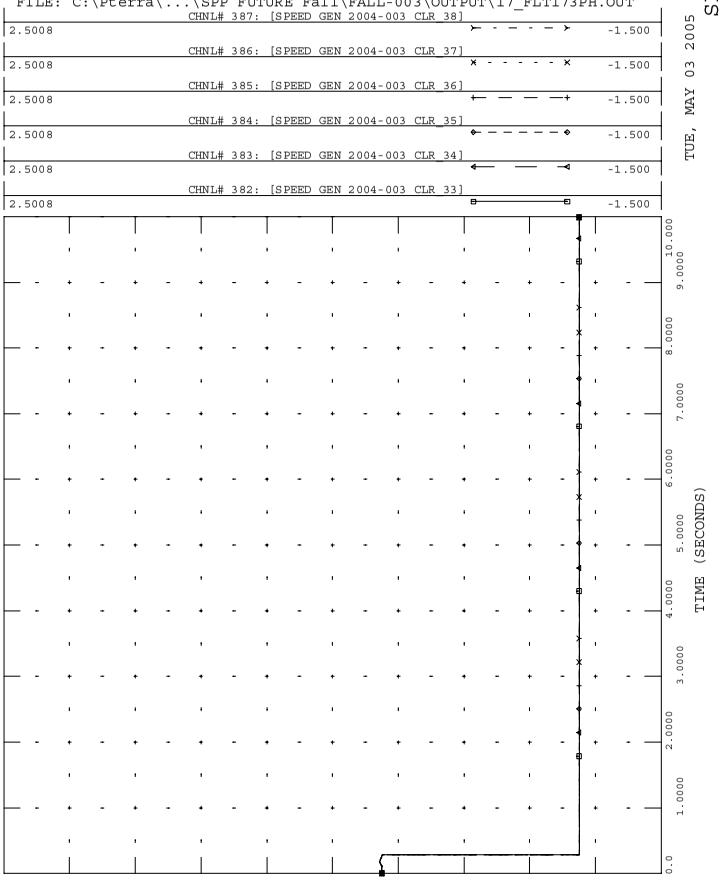
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



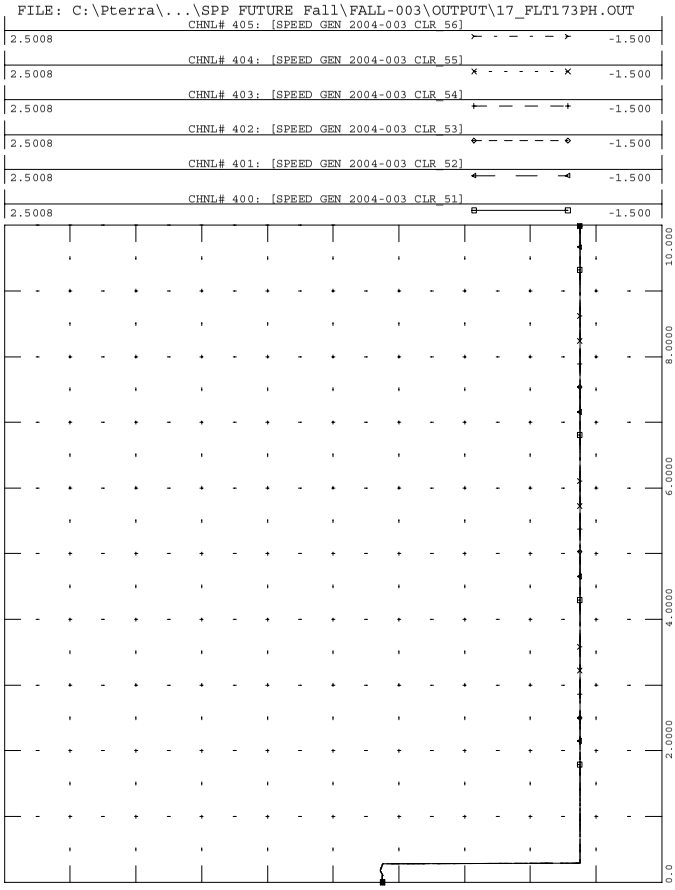
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

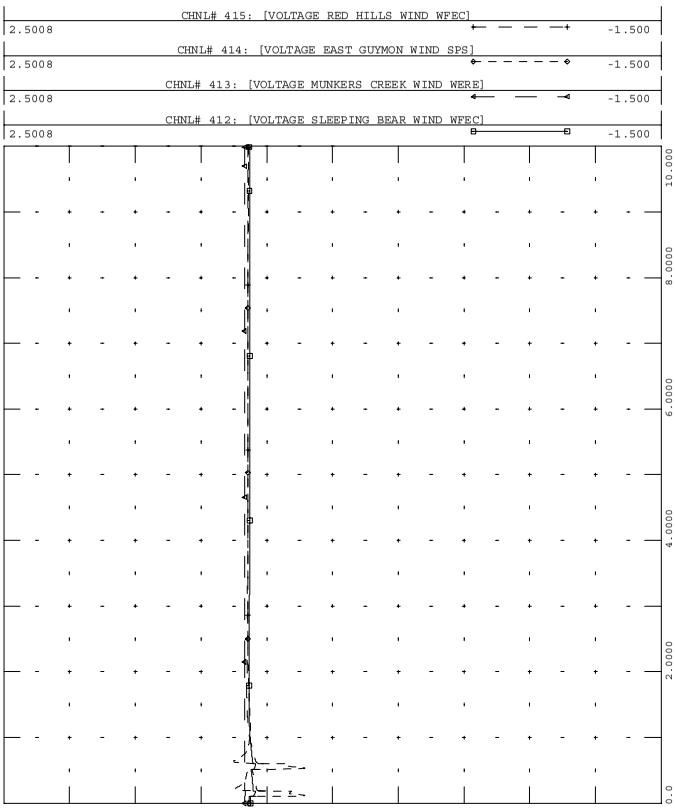
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



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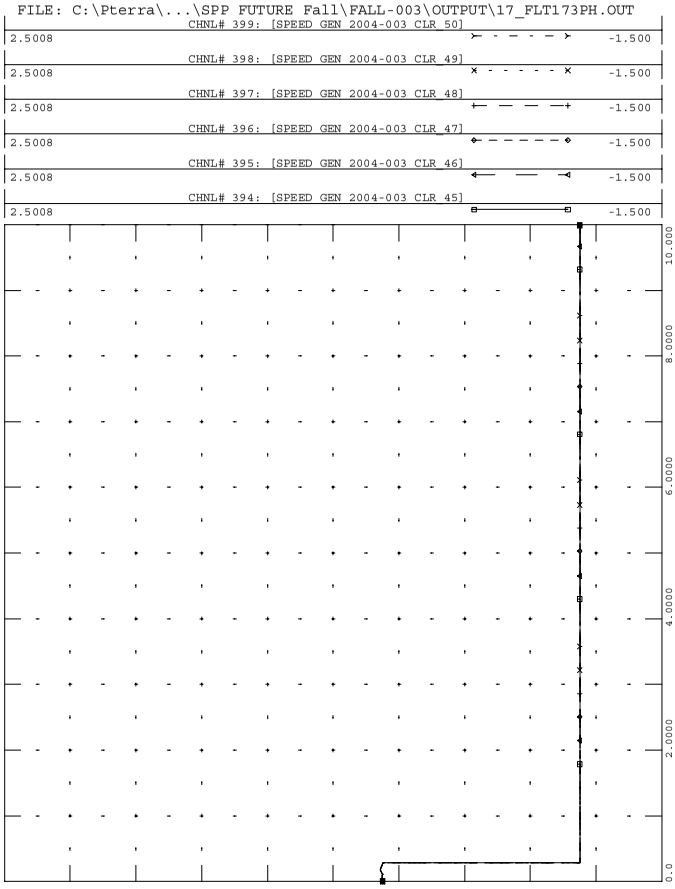
2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

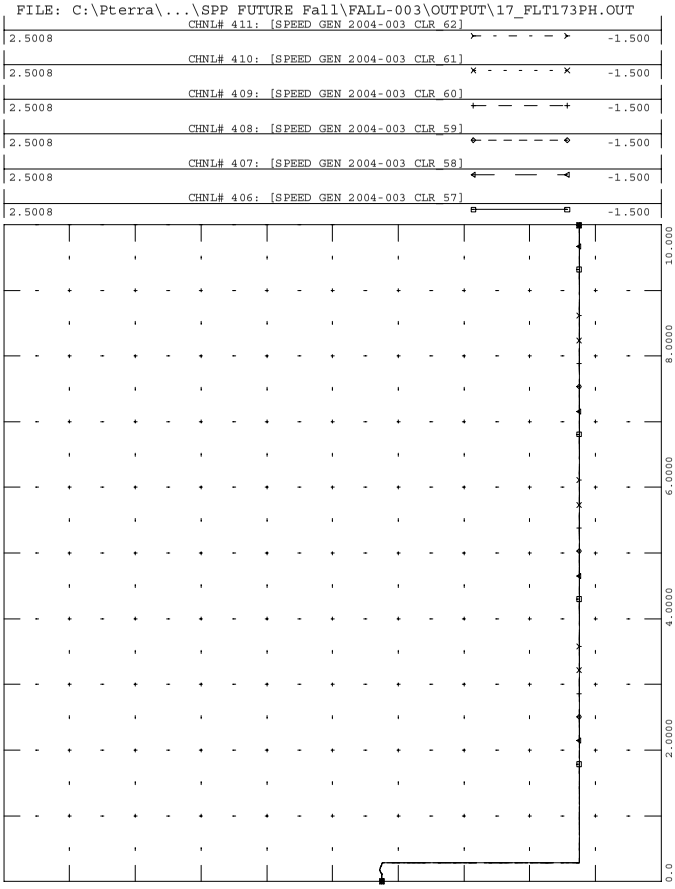
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

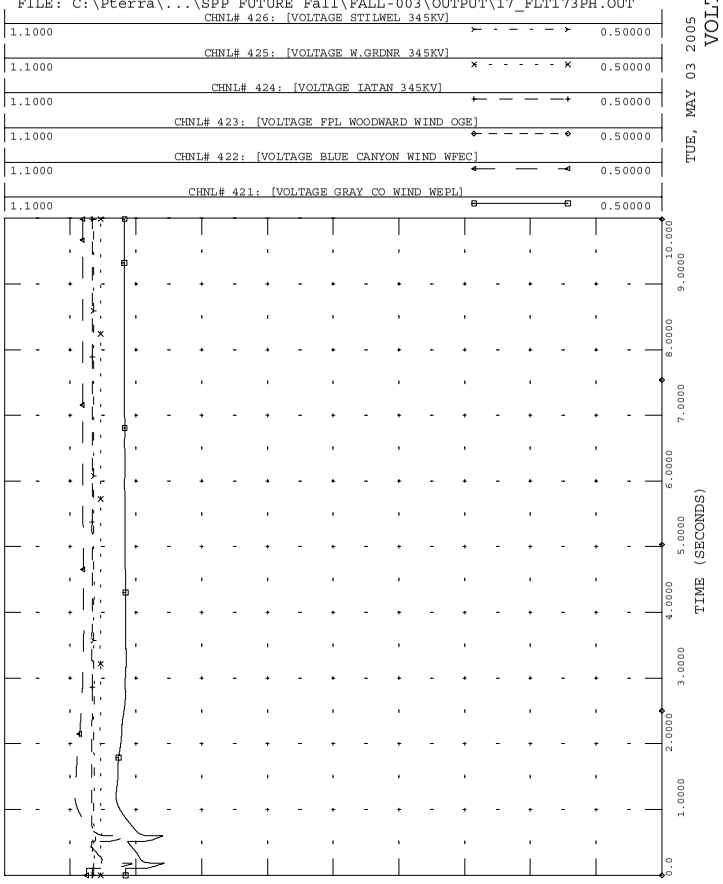
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 SPEED

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

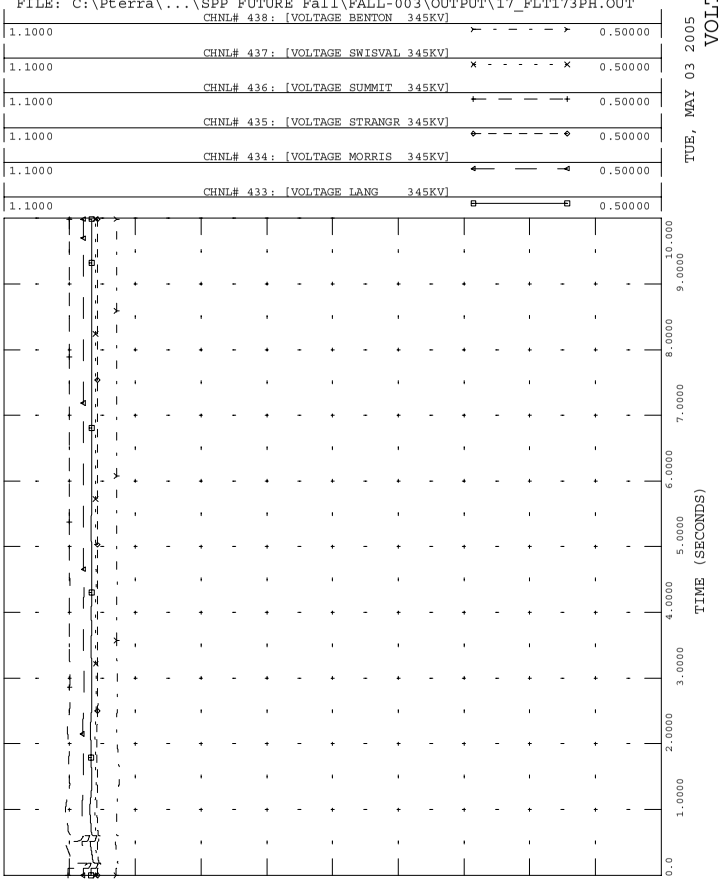
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

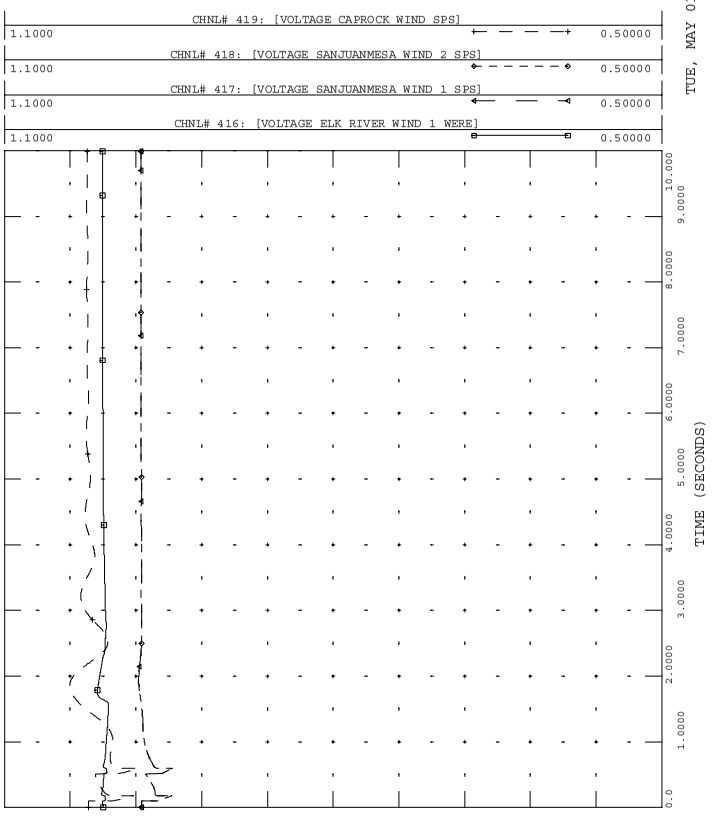
FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT



TUE, MAY 03 2005 15:42 VOLTAGE

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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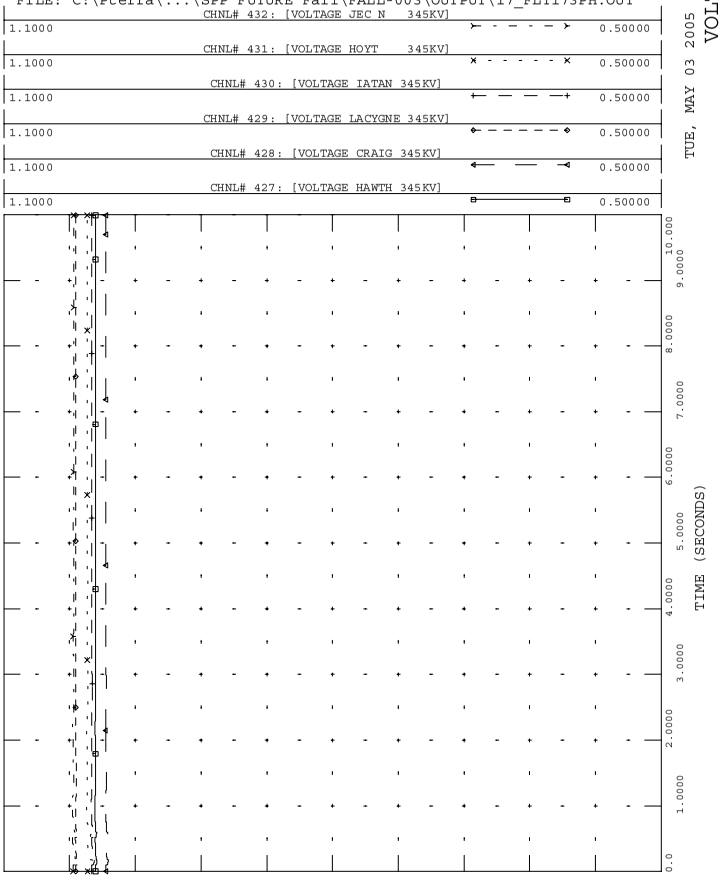

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2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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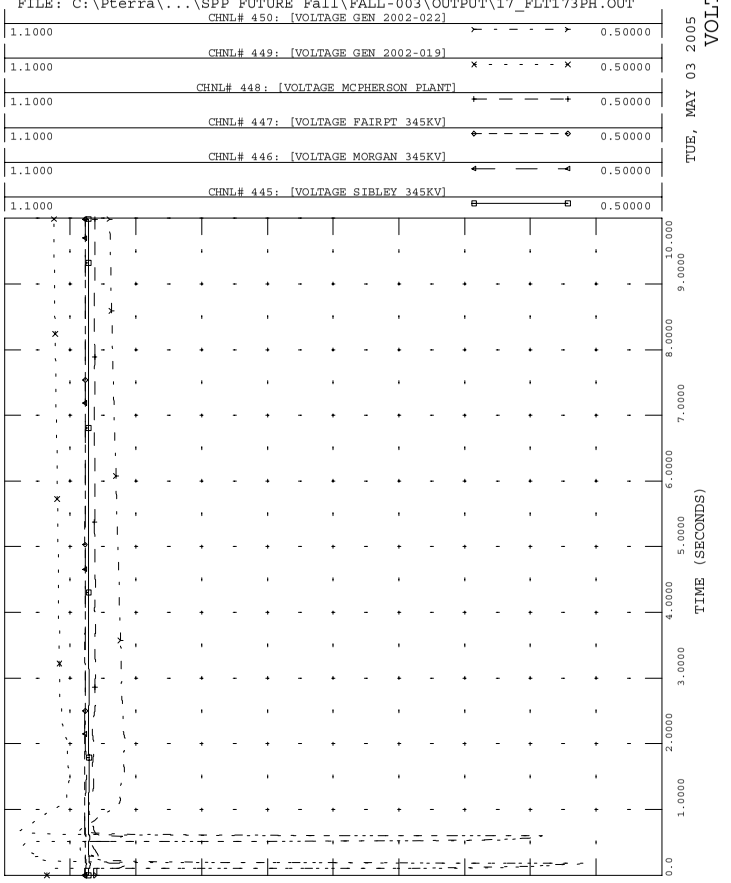

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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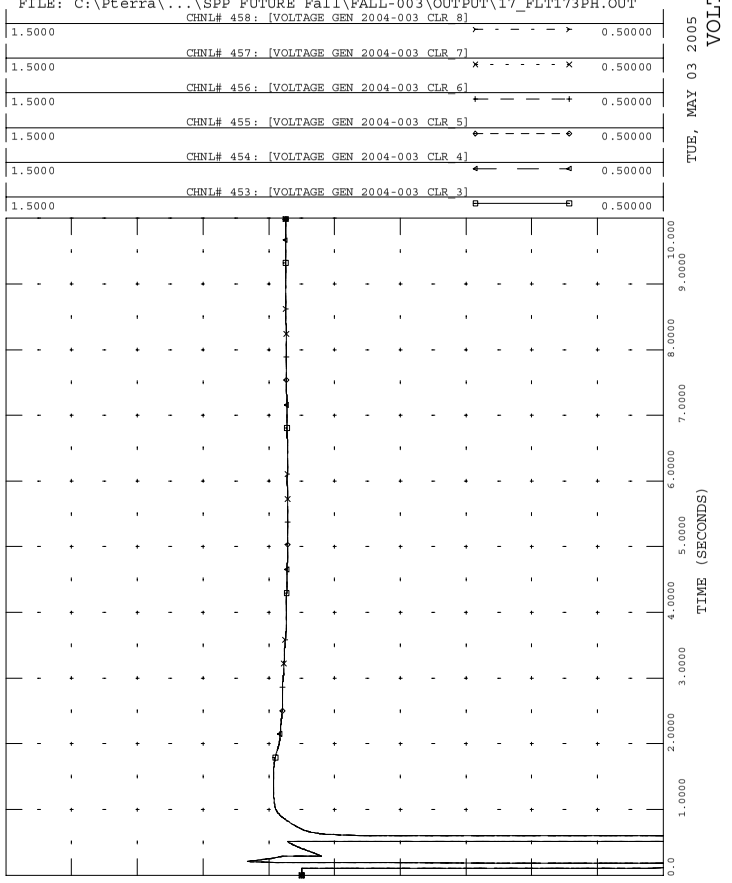

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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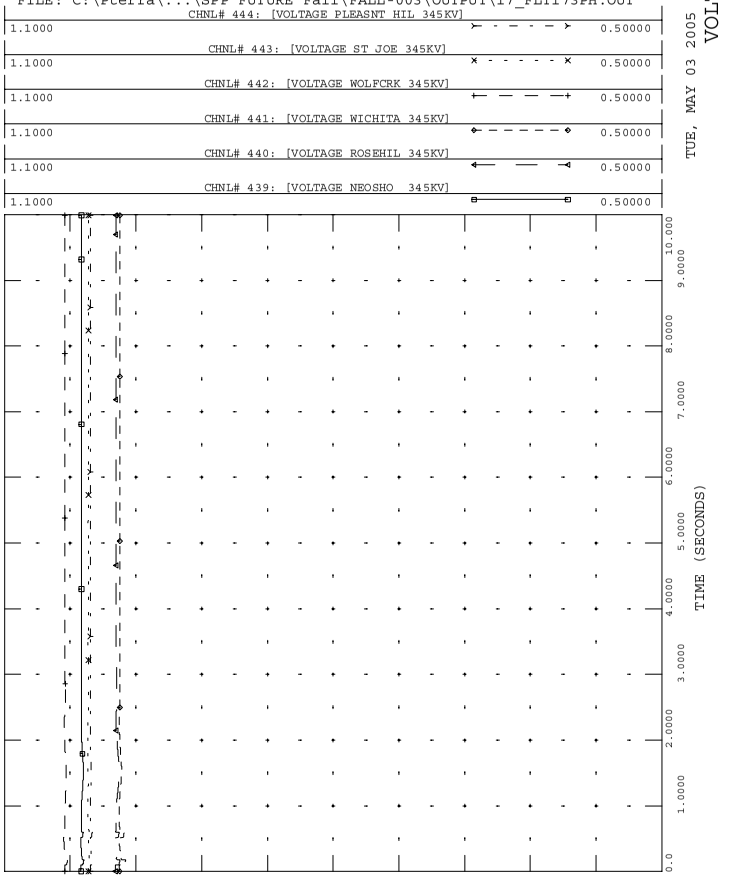

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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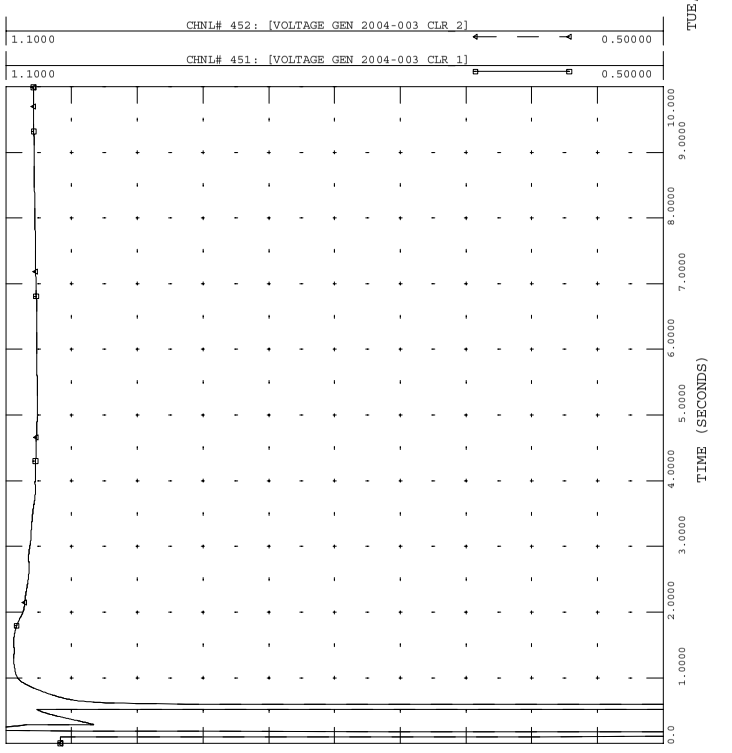

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

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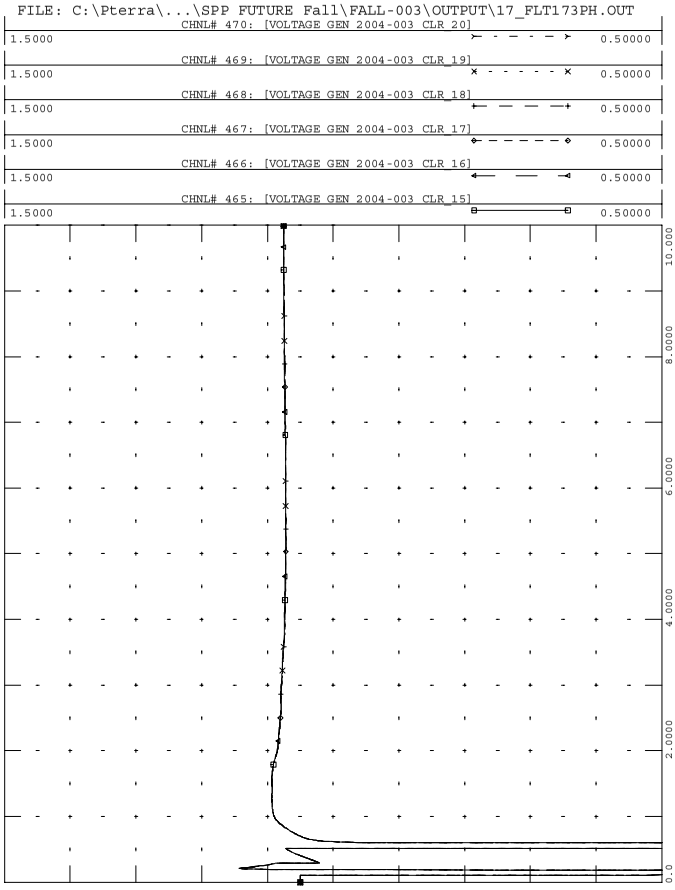
TUE, MAY 03 2005 15:42

VOLTAGE

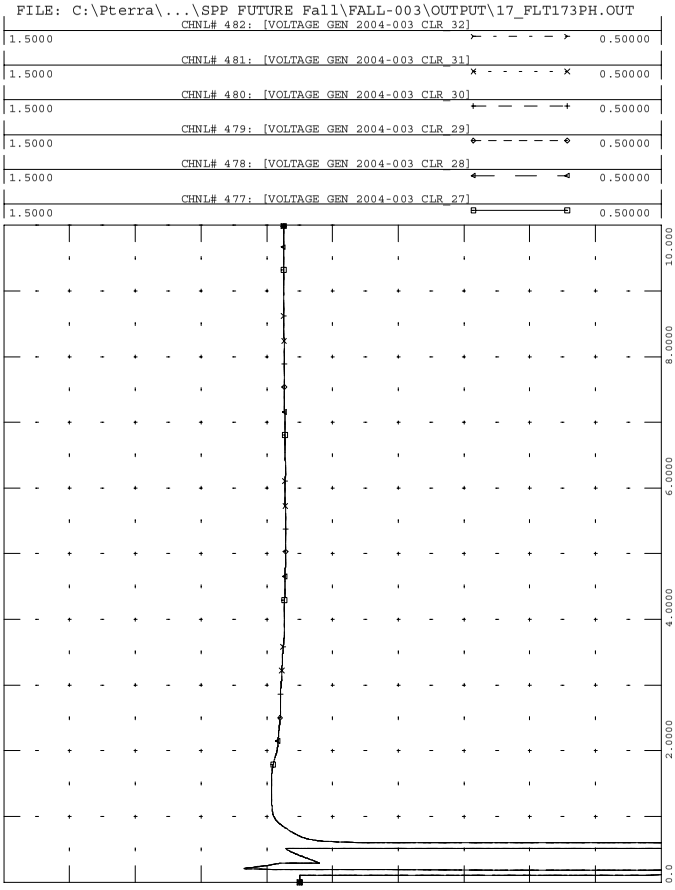


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

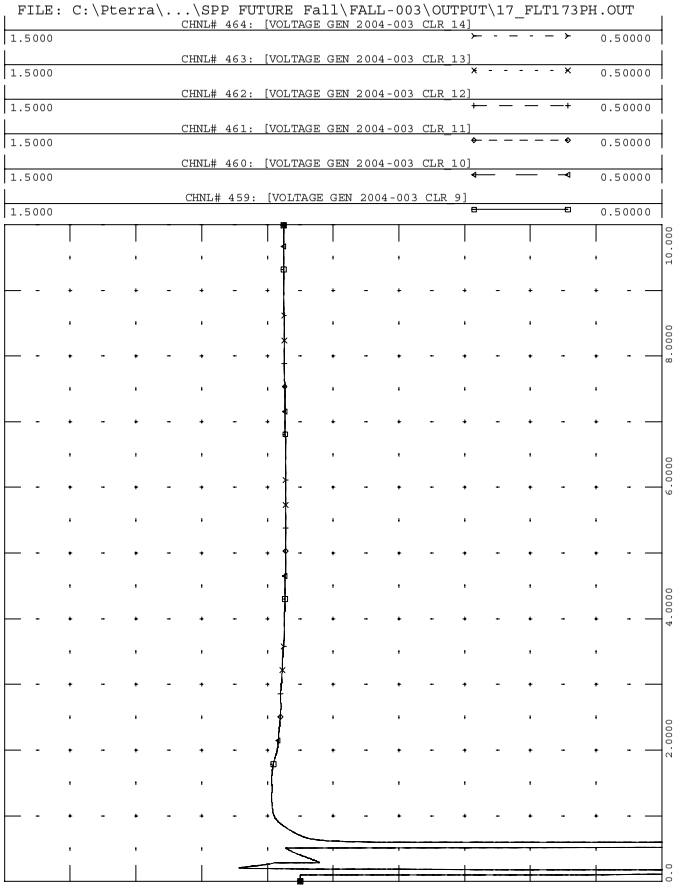


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

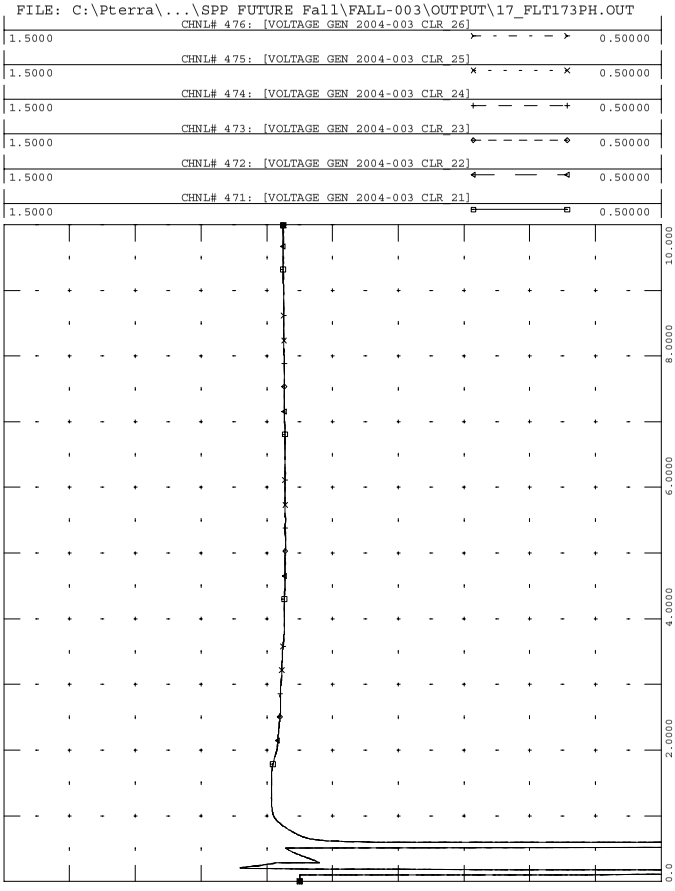


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE



2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

CHNL# 494: [VOLTAGE GEN 2004-003 CLR 44]
CHNL# 493: [VOLTAGE GEN 2004-003 CLR 43]
CHNL# 492: [VOLTAGE GEN 2004-003 CLR 42]
CHNL# 491: [VOLTAGE GEN 2004-003 CLR 41]
CHNL# 490: [VOLTAGE GEN 2004-003 CLR 40]
CHNL# 489: [VOLTAGE GEN 2004-003 CLR 39]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

CHNL# 506: [VOLTAGE GEN 2004-003 CLR 56]
CHNL# 505: [VOLTAGE GEN 2004-003 CLR 55]
CHNL# 504: [VOLTAGE GEN 2004-003 CLR 54]
CHNL# 503: [VOLTAGE GEN 2004-003 CLR 53]
CHNL# 502: [VOLTAGE GEN 2004-003 CLR 52]
CHNL# 501: [VOLTAGE GEN 2004-003 CLR 51]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

CHNL# 488: [VOLTAGE GEN 2004-003 CLR 38]
CHNL# 487: [VOLTAGE GEN 2004-003 CLR 37]
CHNL# 486: [VOLTAGE GEN 2004-003 CLR 36]
CHNL# 485: [VOLTAGE GEN 2004-003 CLR 35]
CHNL# 484: [VOLTAGE GEN 2004-003 CLR 34]
CHNL# 483: [VOLTAGE GEN 2004-003 CLR 33]

1.5000 0.50000

0.0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000 9.0000 10.000

TIME (SECONDS)

2004 SERIES, NERC/MMWG BASE CASE LIBRARY
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE)

FILE: C:\Pterra\...\SPP FUTURE Fall\FALL-003\OUTPUT\17_FLT173PH.OUT

TUE, MAY 03 2005 15:42

VOLTAGE

CHNL# 500: [VOLTAGE GEN 2004-003 CLR 50]
CHNL# 499: [VOLTAGE GEN 2004-003 CLR 49]
CHNL# 498: [VOLTAGE GEN 2004-003 CLR 48]
CHNL# 497: [VOLTAGE GEN 2004-003 CLR 47]
CHNL# 496: [VOLTAGE GEN 2004-003 CLR 46]
CHNL# 495: [VOLTAGE GEN 2004-003 CLR 45]

1.5000 0.50000

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TIME (SECONDS)